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**A SURVEY OF DAIRY CALCIUM CONSUMPTION BY  
WOMEN IN TWO NEW YORK COUNTIES, 1985 AND 1987  
An Analysis of an Educational Program's Effectiveness**

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## ABSTRACT

It was hypothesized that a calcium education program targeted by Cooperative Extension toward women in Broome County, New York would increase individuals' average calcium intake from dairy products. If, after completion of the program, the average dairy calcium intake in Broome County was statistically different from that in another county in New York (Oneida) not exposed to the program, one could conclude that the program was effective in increasing the consumption of calcium from dairy products.

To test this hypothesis, an initial dairy calcium consumption survey was administered in 1985 before the calcium education program began. This initial survey indicated that average calcium intakes from dairy products were very similar in Broome and Oneida counties, 427 and 421 mg per day respectively. These estimates were not statistically different. The results from a second survey in 1987, after completion of the program, indicated that the average calcium intake (from dairy products alone) rose to 445 mg per day in Broome County (an increase of 18 mg) and to 431 mg (a 10 mg increase) per day in Oneida County. Thus, each county's average dairy calcium intake increased, with the greater increase in Broome County. Although this might lead one to believe that the Broome County calcium education program was effective, the difference between the two counties average calcium intakes was not statistically significant.

## EXECUTIVE SUMMARY

In the fall of 1987, the second phase of a two-part research study was initiated to measure the degree of influence a calcium education program had on changing consumers' eating habits, specifically concerning dairy products. The study surveyed women in Broome and Oneida counties in New York. Women in both counties were interviewed by telephone during the fall of 1985, before the establishment of the calcium education program in Broome County. In the fall of 1987, another sample group of women in both counties was interviewed, after the completion of this program. Residents in Broome were exposed to the expanded educational program on the value of calcium in the diet while those in Oneida were not. Average dairy calcium intakes were determined for each county and year from the telephone interviews, and these were compared to see if Broome County 1987 was statistically different from Oneida County 1985 and 1987, and Broome County 1985.

It was hypothesized that dairy product consumption would be higher among residents in the treatment county (Broome) compared to the control (Oneida), due to the effect of the specific dairy calcium educational programming. While average dairy calcium intakes did increase in both counties over time (18 mg in Broome, 10 mg in Oneida), the difference between Broome and Oneida counties was not significant enough to support the hypothesis that the educational program increased calcium intakes from dairy products. In general, no significant differences were found between the calcium intakes of women interviewed in 1985, before the establishment of the educational program, and those of the women interviewed in 1987, after completion of the program. Substantially influencing these levels of significance, however, were the large variations in calcium intakes found among the respondents in each county and in each year.

Factors other than the specific dairy calcium programming in Broome County that could have affected dairy calcium intakes (including educational efforts by dairy organizations, other sources of health and nutrition information, changing demographics, and changes in attitudes toward dairy product consumption) were also considered to determine if the programming had a more obvious effect on dairy calcium intakes of population subgroups.

Overall, dairy calcium intake was positively correlated with education, income, household size, and pregnancy, and negatively correlated with lactose intolerance and age. The number of women taking calcium supplements rose slightly from 1985 to 1987, while their intake of dairy calcium decreased over the same time period. However, 93 percent of the respondents in 1987 reported consuming dairy products during the diet recall, and the total number of dairy foods reported consumed rose by 21 percent in 1987 to 2,303.

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A SURVEY OF DAIRY CALCIUM CONSUMPTION BY  
WOMEN IN TWO NEW YORK COUNTIES, 1985 AND 1987

An Analysis of an Educational Program's Effectiveness

INTRODUCTION

Calcium is a necessary nutrient in the body. Besides being vital for the strength and integrity of teeth and bones, it also aids in the regulation of blood pressure and in the functioning of the nervous system. If too little calcium is present in the diet, calcium will be removed from the bones to fill the other needs of the body. Osteoporosis can result from continued loss of bone calcium, leaving bones fragile and brittle, ready to break under little or no stress. Certain types of hypertension or high blood pressure may also be related to a lack of calcium in the diet.

In the fall of 1985, Broome County Cooperative Extension, along with Cooperative Extension agencies of other Southern Tier counties in New York, began conducting an educational program to increase awareness among women (as well as among educators and health professionals) of the necessity of calcium in the diet. Emphasis was placed on milk and other dairy products as sources of dietary calcium. In an attempt to determine the effectiveness of educational programming on changing recipients' behavior, "before" and "after" surveys were conducted. Each survey was administered to the same target population, with half of the respondents living in a control county (Oneida) and half in a "program" county (Broome). The first survey was conducted in the fall of 1985, and the second in the fall of 1987 after completion of the special calcium program. Both surveys were designed to measure calcium consumption from dairy products as well as determine respondents' attitudes and concerns towards dairy products.

STUDY OBJECTIVES

The primary purpose of this study was to determine the impact of the calcium education program on the consumption of dairy products by women in the program county (Broome). It was reasoned that dairy calcium intake levels should rise in Broome County relative to those in Oneida County if the calcium education program was effective. To reach this objective, two preliminary goals first had to be achieved.

First, the dairy calcium intakes of women in Broome and Oneida counties had to be measured, both before the specific educational effort began and after it was completed. This was accomplished through telephone surveys in 1985 ("before") and 1987 ("after"). Secondly, the relationships between dairy calcium consumption and other factors, such as age, income, education, and household size, had to be estimated. This was accomplished using descriptive statistics and regression analysis, and was designed to indicate if the dairy calcium intakes appeared to follow particular trends in specific population segments, or if certain population segments responded differently to the educational programming.

## CALCIUM PROGRAMMING AND PROMOTION IN BROOME AND ONEIDA COUNTIES

Cooperative Extension planned its educational programming to target the populations of seven central New York counties. From these, Broome County was selected to represent those receiving the programming. Oneida County was then selected to be the control county, representing the counties not encompassed in this particular Cooperative Extension educational program. The use of Broome and Oneida as comparison counties was suggested by their similar demographics and their successful pairing in previous research efforts by Cooperative Extension. The results from the first study in 1985 bore this out, with similar average dairy calcium intakes across the various demographic groups in the two counties.

Oneida County was in a good position to serve as a control, both by having similar characteristics and media exposure as Broome County, and by not being included in Cooperative Extension's calcium education program. As a control, it was hoped that Oneida County would filter out the effects of time and other variables which would impact equally on both counties during the period between the two surveys. Thus, relative changes between Broome and Oneida counties could be estimated by comparing average calcium intakes in the two counties. This allows inferences to be made concerning changes in calcium intakes across time, while accounting for advertising and promotion (national, branded, and generic), population changes, and trend, all of which should have had an equal effect on the residents of both counties.

### National Programming

The dairy industry is very active in supporting dairy calcium through advertising, promotion, nutrition education, and research. As part of its national advertising and promotion program, the National Dairy Board spent \$16.5 million on national calcium advertising in fiscal 1987 as well as \$8.6 million on nutrition education and research.<sup>1</sup> As far as can be determined, residents of both Broome and Oneida counties had equal exposure to these national promotion efforts.

### Regional Programming

Regional support for dairy calcium promotion came in part from Dairy, Food, and Nutrition Council (DFNC) (a Dairy Council unit which has since merged with other Dairy Councils in the region to become Dairy Council, Inc.), which budgeted \$800,000 for nutrition education in fiscal 1986 in upstate New York. The programs sponsored by DFNC included those aimed at health professionals, elementary and high school teachers, and consumers.<sup>2</sup>

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<sup>1</sup> USDA, Report to Congress on the Dairy Promotion Program, Agricultural Marketing Service, Washington, DC, July 1, 1987.

<sup>2</sup> J. R. Tauer and O. D. Forker, Dairy Promotion in the United States, 1979-1986, A.E. Res. 87-5, Department of Agricultural Economics, Cornell University, 1987.

Each of these three programming areas had a strong emphasis on calcium and its importance in the diet.

Dairy Council, Inc. (DCI) provided the following information on calcium programming specific to Broome and Oneida Counties. Between April 1986 and February 1987, Dairy Council, Inc. presented a slide/tape show and a workshop on calcium and osteoporosis to approximately 274 people in Broome County and to 25 people in Oneida County. Calcium brochures were also distributed during that period at various agencies and schools in the two counties, with 1,820 brochures (or 1 for every 117 county residents) distributed in Broome County, and 375 in Oneida (or 1 for every 676 county residents). A calcium exhibit was shown by Dairy Council, Inc. at malls, schools, and meetings in both counties, but no data on numbers of consumers who viewed these exhibits are available. However, it is estimated that a larger absolute number would have seen the exhibits in Broome County, due to the greater proportion of the population living in urban areas.

Dairy Council, Inc.'s somewhat larger program effort in Broome County than Oneida complemented Cooperative Extension's educational effort there, and any increase in Broome County's average calcium consumption would need to be attributed to both programs.

#### Broome County Programming

The calcium programming sponsored by Cooperative Extension in Broome County included the following. Approximately 1,350 women received "one to one" contact through paraprofessionals in the Expanded Food and Nutrition Education Program (EFNEP) which is designed to reach lower income families, especially those with small children. Another 75 women received calcium information through the Special Supplemental Food Program for Women, Infants, and Children (WIC). Programs and classes held by Cooperative Extension staff were attended by 1,022 women between the ages of 20 and 45, (or by 1 out of every 209 county residents). A slide set focusing on calcium awareness for low-income women was also prepared by the Cooperative Extension staff, and was primarily shown to groups of 10 to 15 women participating in the EFNEP program, as well as to some 4-H clubs. No records are available on the total number of county residents who viewed the slide program, however.

Media presentations on calcium by Broome County's Cooperative Extension included three "Food Fact" columns in the Press and in the Sun Bulletin, which reached an estimated 45,715 individuals (21 percent of the county's population). Two television spots on calcium were also sponsored by Cooperative Extension: one on WBNG-TV entitled "Calcium and Osteoporosis" which ran for 30 minutes and reached approximately 12,000 persons (5.6 percent of the county's population), and one on WCIZ-TV entitled "Calcium on a Limited Budget" which ran for 5 minutes and reached approximately 40,000 people (19 percent of the county's population). Cooperative Extension published two articles in Living Magazine ("Milk Facts and Fallacies" and "Your Bones-A Personal Calcium Bank") which has a circulation of 1,600. Four thousand brochures and Fact Sheets on calcium (one for every 53 county residents) were also distributed by Cooperative Extension during the two-year period, and 235 additional calcium brochures were taken by people visiting Cooperative Extension exhibits in various

areas of Broome County. A total of 1,425 hours by Cooperative Extension paraprofessionals and 275 hours by the professional staff were invested on calcium education and programming. This total calcium programming effort cost approximately \$18,000, including staff time and materials.

### Oneida County Programming

Oneida County's Cooperative Extension also provided calcium programming to county residents during the same time period. This programming in Oneida County included two, one-hour radio shows focusing on calcium in the diet aired on WBIX, each estimated to reach 18,000 consumers (7 percent of the county population). Also, 1,600 newsletters and calcium pamphlets were distributed (1 for every 158 county residents), and three presentations on calcium were attended by a total of 100 people. This calcium programming was developed independently of Broome County and is probably comparable to what would have been done in Broome if the special calcium education programming had not been planned. This should be kept in mind when interpreting the survey results.

### Other Issues Affecting Calcium Intake

Residents of both counties receive information about dairy products and calcium from many sources in addition to the educational efforts outlined here. Calcium supplement advertising and branded advertisements for products stressing the value of calcium (either in conventional dairy products or in newly supplemented foods including orange juice, soft drinks, fluid milk, and cottage cheese) are two sources of information. Generic dairy advertising can also affect calcium intake by increasing the consumption of dairy products, even if calcium is not mentioned as a benefit in the ad. Advice from health professionals, family, or friends, as well as articles in newspapers or magazines, or news items heard on TV or radio, may cause people to change their dairy calcium consumption. It is assumed that these sources of information are equally available (and unavoidable, in some cases) in both counties, so that women in both Broome and Oneida counties would have had equal exposure opportunities.

## SAMPLE AND SURVEY METHODOLOGY

### Sample Design

The target population chosen for the calcium intake surveys was women over the age of 18 living in either Broome or Oneida counties. It was determined that at least 750 completed interviews were required for each survey to allow statistical inferences to be made. A new sample was drawn for each survey.<sup>3</sup> Randomized sampling techniques were used, designed to include approximately equal numbers of women from each county. The first survey (fall 1985) yielded a total of 753 completed interviews overall (391

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<sup>3</sup> See S. J. Hurst, Assessing Calcium Intake of Women in Two New York Counties, Cornell University, 1986 (M.S. thesis) for the statistical formula used in the sample size calculation.

from Broome County, 362 from Oneida County), while the second survey (fall 1987) gathered a total of 761 completed interviews (385 from Broome County, from 376 Oneida County).

### Survey Design

A telephone survey format was chosen for several reasons. Chief among them was the length and complexity of the survey. It was felt that the 24-hour dietary recall, which was the most important feature of the surveys, could be easily misconstrued or incompletely filled out in a mail survey, leading to problems with missing or questionable data. It was also felt that certain respondents might answer falsely or wait until a day when they ate a "good" diet to answer the questionnaire, thereby presenting their food habits in a better light and consequently biasing the results.

Telephone surveys allow the interviewer to explain survey questions to respondents in depth and probe responses until it is felt that a full and accurate answer has been achieved. The survey length was also less intimidating during a phone survey (an interview on average took 10 to 12 minutes to complete), and a good response rate of approximately 70 percent was achieved.

The surveys focused strictly on the consumption of dairy foods, due both to the emphasis of the Cooperative Extension's programming on calcium from dairy products as well as the need to make the survey concise and easily administered in a brief telephone interview.

### Survey Administration

The Cornell Institute of Social and Economic Research (CISER) administered both calcium intake surveys from the Cornell campus. The authors developed the survey instrument which focused on a 24-hour dietary recall, as well as attitude and usage questions about dairy products, questions on lactose intolerance and the use of calcium supplements, and demographic questions including age, income, pregnancy, household size, and education (see Appendix 2). A pre-letter was sent to all households to be called, on Cornell stationery, explaining that they would be contacted in the near future. The name and telephone number of the primary investigator were listed, with instructions to call collect if there were any questions concerning the survey.

It was felt that this pre-letter would help assure the respondents of the legitimacy of the survey and make them more willing to be interviewed. As many of the potential respondents (especially in Oneida County) were older women who are often particularly concerned about strangers and fraud, the pre-letter provided a valuable introduction service. A pamphlet on calcium in the diet was also offered to each respondent, after completion of the interview, as a small token of appreciation. In each survey, all names were removed from the interviews immediately after completion to maintain strict confidentiality. All data were then aggregated, with no individual responses singled out.

The telephoning was accomplished during October 1985 and October 1987. Before each survey, the interviewers underwent a specialized training session concerning the survey topics and how best to ask the questions and respond to respondents' concerns, as well as role playing and conducting sample interviews. Once surveying began, each completed questionnaire was checked for legibility and completeness immediately following the interview. At this point the data were coded and entered into a computer using a double-entry system to avoid data input errors. The administration and data coding of the surveys were designed to be as similar and as error-free as possible.

### Survey Instrument

As the purpose of the second survey was comparison of the results with those from the first, the questionnaires for both surveys were identical except for the following. The 1987 survey contained added questions on attendance at calcium presentations, and awareness of calcium advertising and sponsor identification. These were not included in the 1985 survey as the calcium education activities had not yet begun. The 1987 survey is included in Appendix 2 and is representative of both surveys.

The respondents were asked to recall everything that they had eaten or drunk over the previous 24 hours. By leading respondents through each meal that they had eaten during the previous day, it was felt that memory lapses were kept to a minimum. It also helped respondents avoid including other foods in their recall which they had actually consumed prior to the 24-hour period in question.

To avoid biasing the respondents, all foods were noted although the actual purpose of the survey included only dairy products. The interviewers were trained to probe the respondents' replies and question respondents on ingredients in "combination foods" such as casseroles or sandwiches. If they contained dairy products, the respondents were then asked to estimate as closely as possible the amount of dairy products in the portion that they ate. Cream in coffee or tea was included as well as any between meal snacks.

The interviewers recorded the quantities of dairy foods estimated consumed on special sheets within the questionnaire, recording one meal or snack on each page (see Appendix 2). Each dairy food consumed was coded by its type (i.e., whole milk was a 1, Swiss cheese an 89). A codebook was then used that provided calcium contents for each type of dairy product in one-cup or one-ounce increments (i.e., one cup of whole milk has 291 mg of calcium while one ounce of Swiss cheese has 272 mg).

The amount of calcium a specific respondent received from a dairy product was calculated by multiplying the calcium levels for that food by the amount the respondent ate (i.e., 1/2 cup of whole milk would equal 146 mg calcium or  $291 \text{ mg} \times .5$ ). A total calcium consumption figure was then calculated for each respondent by summing the milligrams (mg) of calcium from all the dairy products that she had reported in the dietary recall.

The questionnaire also included questions on the respondents' "typical" diet, lactose intolerance, use of calcium supplements, concerns about fat

in dairy products, and past consumption of dairy products. Questions on age, income, pregnancy status, and education provided demographic information.

### Response Rate

A total of 1,299 households were called in the 1987 survey, with 761 completed interviews attained for an overall response rate of 58.6 percent. The 1985 survey had a 61.3 percent response rate, with 1,230 households called and 753 completed interviews. However, if response rate is defined as the percentage of those eligible to be surveyed who completed the interviews, the response rate was 75.9 percent in 1985, and 71.2 percent in 1987 (Table 1).

Table 1. Survey Response Rates for the Two Counties, 1985 and 1987

Final Outcome	Survey 1 (1985)	Survey 2 (1987)
(Number of Households and Percent of Total)		
Completed the interview	753 (61.3)	761 (58.6)
Not eligible <sup>1</sup>	238 (19.3)	230 (17.7)
Not able to contact <sup>2</sup>	63 (5.1)	57 (4.4)
Incomplete interview <sup>3</sup>	34 (2.8)	23 (1.8)
Refusals	142 (11.5)	228 (17.6)
Total households called	1,230 (100.0)	1,299 (100.0)

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

<sup>1</sup> "Not eligible" includes nonworking telephone numbers, nonresidence numbers, and numbers where there is no woman living in the household.

<sup>2</sup> "Not able to contact" includes telephone numbers where no one ever answered, numbers which were continually busy, and numbers answered by an answering machine.

<sup>3</sup> "Incomplete interview" includes telephone numbers where the respondent was incapacitated, or requested to be called back past the end of the interviewing period, a respondent who didn't speak English, or respondents who only granted a partial interview.

### ANALYSIS OF SURVEY RESPONSES

The survey responses were analyzed two ways: by descriptive statistics and regression analysis. Average dairy calcium intakes were calculated for specific demographic groups (age, education, income, pregnancy, lactose intolerance, etc.), and separated by county and survey year. Comparisons of average calcium intakes of respondents in different demographic groups

were made (i.e., do pregnant women consume significantly different amounts of dairy calcium than nonpregnant women, regardless of county) as well as comparisons of mean calcium intakes of women in the same demographic group but separated by county (i.e., do pregnant women in Broome County eat significantly more dairy calcium than women in Oneida County). The number and type of dairy foods consumed, as well as awareness of calcium advertising, were also analyzed.

Multiple regression analysis was used to isolate and hold the variables constant to determine the extent to which each factor or variable influenced calcium intake from dairy products. By using a dummy variable to represent the Cooperative Extension's calcium programming in Broome County, its effectiveness in influencing dairy calcium consumption could be statistically established.

#### Descriptive Statistics

##### Number and Types of Dairy Foods Consumed in 1985 and 1987

In the 1985 survey, 9 percent of respondents reported eating no dairy foods whatsoever during the 24-hour diet recall period; this figure fell to 7 percent in the 1987 survey. Responses from each individual who did report consuming dairy products were analyzed to determine the types of items eaten and their frequency (Table 2).

Table 2. Specific Dairy Foods Reported Consumed in Both Counties During the 1985 and 1987 Surveys of Dairy Product Consumption

Number of Times Reported		Types of Dairy Foods Consumed by Respondents
1985	1987	
9	26	Feta, Blue, Limburger, and Camembert cheeses
103	121	Cheddar and Colby cheeses
42	51	Creamed and lowfat Cottage cheeses
23	30	Cream cheese
42	69	Mozzarella cheese
30	62	Parmesan and Romano cheeses
15	36	Provolone, Ricotta, and lowfat Ricotta cheeses
14	12	Swiss and Gouda cheeses
149	142	Processed cheese, cheese food, and cheese spread
115	139	Half & half (primarily used in coffee and tea)
37	47	Heavy cream, whipped cream, and sour cream
538	583	Whole milk
355	562	2% milk
45	48	1% milk
137	127	Skim milk
25	37	Buttermilk, nonfat dry milk, and canned milk
90	122	Hard and soft ice cream, ice milk, and milkshakes
27	27	Regular and lowfat yogurt
13	12	Puddings and custards (cooked and instant)
41	15	Fast food items with cheese
51	35	Pizza
1,901	2,303	TOTAL

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

Note in the table that these frequencies are not presented in serving-size portions (i.e., one cup of Cheddar cheese and one ounce of Cheddar cheese would each be recorded as one instance of Cheddar cheese consumption). Also note that many respondents reported consuming several different types of dairy products during the diet recall period so that the number of dairy foods consumed is larger than the total number of respondents. Of the 21 types of dairy foods reported, 14 increased in consumption frequency from 1985 to 1987, and 6 decreased. The largest increase was for 2% milk, which was consumed on 207 more occasions in 1987 than in 1985. Whole milk consumption also rose, which was unexpected.

#### Awareness of Calcium Advertising and Its Sponsors

The 1987 survey had an additional component of questions not included in the 1985 survey. Respondents were asked if they were aware of recent advertisements focusing on calcium and if possible to identify the advertisements' sponsors from a list of likely candidates. The 1987 survey

also asked respondents if they had attended any lectures or programs focusing on dietary calcium and if so, who had sponsored them. Respondents in both counties were read identical questionnaires to avoid bias and to determine differences in calcium advertisement awareness in the two counties, each of which was exposed to its own Cooperative Extension's calcium education effort.

Table 3 shows the results of the advertising awareness questions. It is interesting to note that the percentages of advertising attributed to each sponsor are very similar across the counties. This would indicate that sponsorship information was absorbed equally well (or poorly) in both counties. Cooperative Extension is credited with sponsoring calcium advertisements by 34 percent of those who noticed calcium advertising in Oneida County and by 30 percent in Broome. As Oneida County received calcium programming from its own Cooperative Extension agency, but not the special Cooperative Extension calcium education targeted at Broome and the other Southern Tier counties, this may indicate that the two programs were equally effective in their efforts.

Table 3. Comparison of Calcium Advertising Awareness and Its Perceived Sponsors in Broome and Oneida Counties in 1987

	Both Counties		Broome Co.		Oneida Co.	
	No.	Percent	No.	Percent	No.	Percent
Noticed calcium ads or announcements	669	88	330	86	339	90
Saw or heard ads sponsored by the American Dairy Association	177	26*	94	28*	83	24*
Saw or heard ads sponsored by the National Dairy Council	224	33*	115	35*	109	32*
Saw or heard ads sponsored by Cooperative Extension	241	36*	114	35*	127	37*
Saw or heard ads sponsored by New York dairy farmers	191	29*	88	27*	93	27*
Saw or heard ads sponsored by a group not mentioned here	96	14*	51	15*	45	13*
Saw or heard ads but do not know who they were sponsored by	187	28*	91	28*	96	28*

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

\* These percentages were calculated from the respondents who noticed the ads (i.e., 330 in Broome County and 339 in Oneida, 669 overall), not from the total number of respondents in each county or overall. The percentages add up to more than 100 percent as respondents were free to respond with several advertisements and sponsors.

In general, calcium advertisements and announcements have been noticed; 88 percent of the respondents reported awareness. The average dairy calcium intake of those who reported noticing calcium advertising was 443 mg while those not noticing the advertising had an average intake of 404 mg, which is not significantly different. To summarize, people do notice and remember calcium advertisements, but may not correctly recall the sponsor. Also, noticing and remembering calcium advertisements does not necessarily result in statistically greater average dairy calcium intakes.

Of the 761 respondents to the 1987 survey, 39 (5 percent) reported attending a calcium-oriented presentation. Of the 39, 14 were from Broome County and 25 were from Oneida. When asked who sponsored the programs they attended, only one respondent listed Cooperative Extension. The respondent was from Oneida County which is interesting as the Broome County program professed to reach over 10 times as many women in its speaker's program as Oneida County's program (1,022 vs. 100). However, much of Broome County's program focused on speaking at women's clubs, business meetings, and other functions, where women attending may not have attributed the sponsorship to Cooperative Extension even though it supplied the speaker. While those attending calcium lectures or presentations did have a larger average dairy calcium intake than the other survey respondents (480 mg vs. 438 mg), the difference was not significant.

#### Differences Between Demographic Groups in 1985 and 1987

The overall average dairy calcium intake was 424 mg in 1985 and 438 mg in 1987 (no statistical difference). In general, older women in both years consumed less dairy calcium than younger women. In 1985, the 17-29 age group's average dairy calcium consumption was 537 mg, 27 percent higher than the overall average, while the average consumption of the 70-79 age group (368 mg) was 13 percent below the average (Table 4). This trend continued in 1987, with the 17-29 age group consuming 29 percent more dairy calcium than the average, and 55 percent more than the 70-79 group. This is consistent with other research findings which indicate that there is a tendency for older women to consume less calcium from all sources (including dairy products) than younger women.<sup>4,5,6</sup> However, as can be seen in Table 4, standard deviations are quite high, indicating a large amount of variation in the calcium intakes across all age groups. This is true for all demographic characteristics studied here (not just age), and should be considered whenever average dairy calcium intakes are presented.

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<sup>4</sup> J. L. Freudenheim, N. E. Johnson, and E. L. Smith, "Relationships Between Usual Nutrient Intake and Bone-Mineral Content of Women 35-65 Years of Age: Longitudinal and Cross-Sectional Analysis," American Journal of Clinical Nutrition, 1986, 44:863-76.

<sup>5</sup> E. M. Pao, S. J. Mickle, and M. C. Burk, "One-Day and 3-Day Nutrient Intakes by Individuals-Nationwide Food Consumption Survey Findings, Spring, 1977," Journal of American Dietetic Association, 1985, 3:313-324.

<sup>6</sup> J. S. Akin, D. K. Guilkey, B. M. Popkin, and M. T. Fanelli, "Cluster Analysis of Food Consumption Patterns of Older Americans," Journal of American Dietetic Association, 1986, 5:616-624.

Table 4. Mean Dairy Calcium Consumption of Women, by Age Groups

Age	<u>Observations</u>		<u>Calcium</u>	Std. Dev. (mg)	t-score <sup>1</sup>
	No.	Percent	<u>Consumption</u> Mean (mg)		
<u>1985</u>					
17-29	154	20	537	436	1.635
30-39	160	21	462	370	1.594
40-49	114	15	393	332	.051
50-59	94	12	391	321	.640
60-69	118	16	356	439	.210
70-79	78	10	368	343	.721
80 and over	24	3	312	318	
<u>1987</u>					
17-29	120	16	566	508	1.256
30-39	183	24	497	440	2.182*
40-49	133	17	394	371	.258
50-59	106	14	382	336	.221
60-69	113	15	372	322	.195
70-79	85	11	364	292	.753
80 and over	21	3	419	336	

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference between mean calcium consumption levels of one age group and the one below it.

\* Statistically significant at the 90 percent level.

In both survey years, education had a positive effect on average dairy calcium intakes (Table 5). Although this is not as well documented by previous studies as the relationship between age and dairy calcium intake, it is consistent with the belief that at higher education levels more dairy products are consumed. Table 5 shows that the group which had a grade school education had a mean dairy calcium consumption level of 326 mg in 1985 compared to an average of 467 mg for those who had attended or graduated from graduate school (over 43 percent greater). The difference in average calcium intakes between those who graduated from high school and those who attended college or technical school was statistically significant at the 90 percent level in 1985.

Table 5. Mean Dairy Calcium Consumption of Women, by Education

Education Levels <sup>1</sup>	Observations		Calcium Consumption Mean (mg)	Std. Dev. (mg)	t-score <sup>2</sup>
	No.	Percent			
<u>1985</u>					
1	54	7	326	357	.881
2	77	10	377	311	.141
3	267	35	383	326	2.955*
4	126	17	505	481	.576
5	149	20	475	395	.134
6	65	9	467	448	
<u>1987</u>					
1	34	4	337	236	1.047
2	73	10	407	356	.141
3	194	25	414	394	.762
4	217	29	442	353	1.074
5	143	19	487	432	.675
6	72	9	534	555	

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

- <sup>1</sup> 1 = attended grade school or graduated from grade school  
 2 = attended high school  
 3 = graduated from high school  
 4 = attended college or technical school  
 5 = graduated from college or technical school  
 6 = attended graduate school or graduated from graduate school

<sup>2</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between one education level and the one below it.

\* Statistically significant at the 90 percent level.

Household income also tended to have a positive effect on dairy calcium consumption. For instance, women reporting annual household incomes of less than \$10,000 in 1985 consumed 27 percent less dairy calcium on average than women in households with incomes of over \$30,000 (Table 6). However, this difference fell to 12 percent in 1987. Other studies support this finding of increased dairy product consumption with increased incomes.<sup>7,8</sup>

<sup>7</sup> Pao, *op.cit.*

<sup>8</sup> D. Smallwood and J. Blaylock, Impact of Household Size and Income on Food Spending Patterns, USDA Economics and Statistics Service Technical Bulletin 1650, Washington, DC, 1980.

Table 6. Mean Dairy Calcium Consumption of Women, by Income Levels

Income <sup>1</sup>	Observations		Calcium Consumption Mean (mg)	Std. Dev. (mg)	t-score <sup>2</sup>
	No.	Percent			
<u>1985</u>					
1	111	15	360	320	.666
2	178	24	386	327	1.268
3	165	22	434	373	1.266
4	239	32	488	451	
<u>1987</u>					
1	75	10	389	405	.542
2	158	21	416	342	1.195
3	172	23	464	374	.510
4	313	41	444	419	

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

- <sup>1</sup> 1 = household income less than \$10,000  
 2 = household income between \$10,000 and \$19,000  
 3 = household income between \$20,000 and \$30,000  
 4 = household income greater than \$30,000

<sup>2</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between an income level and the one below it.

Tables 7 and 8 demonstrate whether the differences between dairy calcium intakes of other demographic groups are statistically significant. Looking first at pregnancy, it can be seen that the difference between the average dairy calcium intakes of women who were and were not pregnant were statistically significant in both 1985 and 1987. There was also a significant increase in the calcium intake of pregnant women over time, but no such increase was seen for nonpregnant women.

Household size also had a statistically significant effect on dairy calcium consumption. In both survey years, almost 50 percent of the respondents lived in homes with one or no other persons. Women in these smaller households had statistically smaller dairy calcium intakes in both years (Tables 7 and 8). This may not be entirely due to household size, however, as age is highly correlated to both household size and average calcium intakes.

Table 7. Mean Dairy Calcium Consumption, by Demographic Groups, 1985

Demographic Group	Obs.	Mean Calcium Consumption (mg)	Std. Dev. (mg)	t-score <sup>1</sup>
<b>PREGNANCY</b>				
Were pregnant	34	699	450	
Were not (under age 45)	350	459	384	3.426*
<b>HOUSEHOLD SIZE</b>				
2 people or fewer	360	377	350	
More than 2 people	390	470	409	3.342*
<b>WAS DIET "NORMAL" DURING DIET RECALL</b>				
Yes	558	425	390	
No	192	423	370	.055
<b>COMPARE DAIRY FOODS IN DIET RECALL TO USUAL DIET</b>				
Usually eat more dairy	223	380	351	2.408*
Usually eat same amount	446	456	399	
Usually eat less	70	413	382	.801
Don't eat dairy foods	10	98	111	2.828*
<b>COMPARE CURRENT DIET TO 5 YEARS AGO</b>				
Now eat more dairy	176	565	480	4.408*
Now eat about the same	339	403	343	
Now eat less dairy	231	354	327	1.710*
<b>LACTOSE INTOLERANCE</b>				
Yes	119	321	353	
No	630	445	387	3.238*
<b>TAKE CALCIUM SUPPLEMENTS</b>				
Yes	191	440	432	
No	561	420	367	.644
<b>HOW OFTEN TAKE CALCIUM SUPPLEMENTS</b>				
Less than once a week	17	663	907	2.177*
Several times a week	46	437	386	.364
Every day	128	415	340	
<b>CONSIDER AMOUNT OF FAT IN MILK BEFORE PURCHASE</b>				
Yes	452	448	373	
No	292	393	400	1.892*

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY in 1985.

<sup>1</sup> These t-scores are a measure of the statistical significance of the differences between the dairy calcium intakes of the different groups.

\* Statistically significant at the 90 percent level or higher.

Table 8. Mean Dairy Calcium Consumption, by Demographic Groups, 1987

Demographic Group	Obs.	Mean Calcium Consumption (mg)	Std. Dev. (mg)	t-score <sup>1</sup>
<b>PREGNANCY</b>				
Were pregnant	31	903	587	
Were not (under age 45)	337	474	424	5.205*
<b>HOUSEHOLD SIZE</b>				
2 people or fewer	373	400	366	
More than 2 people	388	475	425	2.589*
<b>WAS DIET "NORMAL" DURING DIET RECALL</b>				
Yes	577	445	388	
No	183	421	432	.712
<b>COMPARE DAIRY FOODS IN DIET RECALL TO USUAL DIET</b>				
Usually eat more dairy	213	393	397	2.035*
Usually eat same amount	456	457	376	
Usually eat less	77	480	488	.464
Don't eat dairy foods	14	296	560	1.555
<b>COMPARE CURRENT DIET TO 5 YEARS AGO</b>				
Now eat more dairy	152	514	493	.695
Now eat about the same	326	484	411	
Now eat less dairy	281	345	300	4.700*
<b>LACTOSE INTOLERANCE</b>				
Yes	137	346	327	
No	623	459	411	3.013*
<b>TAKE CALCIUM SUPPLEMENTS</b>				
Yes	210	391	335	
No	551	456	420	2.001*
<b>HOW OFTEN TAKE CALCIUM SUPPLEMENTS</b>				
Less than once a week	30	393	349	.358
Several times a week	44	469	340	1.713*
Every day	132	369	332	
<b>CONSIDER AMOUNT OF FAT IN MILK BEFORE PURCHASE</b>				
Yes	544	442	394	
No	214	428	414	.447

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY in 1987.

<sup>1</sup> These t-scores are a measure of the statistical significance of the differences between the dairy calcium intakes of the different groups.

\* Statistically significant at the 90 percent level or higher.

While almost 25 percent of respondents (in each survey year) said that their eating patterns during the 24-hour diet recall were not "normal" for them, this did not have a statistically significant effect on their average dairy calcium intakes (Tables 7 and 8). This indicates that it is valid to include the calcium intakes of those who said it was not a normal day with the calcium intakes of the rest of the respondents. The respondents were also asked if on a "typical day" they would usually eat more, less, or about the same amount of dairy products as they reported in their 24-hour diet recalls. Only 1 percent of the respondents in 1985 said they never ate dairy products, rising to 2 percent in 1987 (Tables 7 and 8). In both survey years, those who said that they usually ate more dairy foods than they did on the day of the diet recall had significantly lower dairy calcium intakes than those who said their diet that day was normal for them. The other statistically significant difference was seen in 1985 between those who had consumed their usual amount of dairy products and those who do not eat dairy products. This same comparison did not yield a significant difference in 1987, however.

Respondents were also asked to compare their current dairy food consumption to that of five years ago. An examination of the responses from 1985 and 1987 shows that fewer people now see themselves as increasing their dairy product consumption, while more people feel that they have decreased their consumption (Tables 7 and 8). Comparing their dairy calcium intakes to that of the group continuing to eat the same amount of dairy foods as five years ago shows statistically significant differences. As would be expected, those now eating fewer dairy products had significantly lower dairy calcium intakes, while those now eating more dairy foods had significantly higher calcium intakes (true only in 1985).

Approximately 17 percent of the respondents in both 1985 and 1987 reported having lactose intolerance (Tables 7 and 8). Those with lactose intolerance had significantly lower average calcium intakes than those not lactose intolerant, although they still consumed substantial amounts of dairy calcium.

The number of women taking calcium supplements rose from 25 percent in 1985 to 28 percent in 1987. While the difference in average dairy calcium intakes between women taking calcium supplements and those not taking them was significant in 1987, this was not true in 1985 (Tables 7 and 8). (Note: these average calcium estimates include only calcium from dairy products; no attempt was made to determine the additional calcium contributed by the supplements.) Looking at changes over time, dairy calcium intake decreased in the group taking calcium supplements, and rose in the group not taking supplements. This suggests that the surveyed population had begun substituting calcium supplements for dairy foods as a source of calcium from 1985 to 1987. The majority of the women taking calcium supplements also took them at least once a day. In 1985, the difference in dairy calcium intakes between those taking supplements once a day and less than once a week was statistically significant, while the difference between those taking supplements several times a week versus those taking them daily was not significant. In 1987, those positions were reversed.

Fat in the diet, particularly saturated fats such as those found in animal products including dairy products, is a matter of concern to many consumers. Respondents were asked if they considered the fat content in

milk, cheese, or ice cream before they purchased these items. The percent considering the fat content for each category rose over time (from 60 percent to 71 percent for milk, 27 percent to 29 percent for cheese, and 18 percent to 23 percent for ice cream), indicating increasing interest and concern. Looking only at milk, it can be seen that the average dairy calcium intakes of those that considered the fat content of milk versus those that didn't were further apart in 1985 (significantly so) than they were in 1987 (Tables 7 and 8). This says that while more women considered the amount of fat in fluid milk in 1987 than in 1985, they consumed just as much calcium from dairy products as those who did not consider the fat levels.

#### Differences Between Counties in 1985 and 1987

Figure 1 graphically presents the average dairy calcium intakes for each age group in each county and year. By presenting the data graphically, calcium consumption patterns can be considered across time and population subsets simultaneously. Tables containing complete data for all of the figures can be found in Appendix 1.

Looking at differences in average dairy calcium intakes between women in Broome and Oneida counties (in the same age ranges in the same year), it can be seen that the only statistically significant differences occur in the 50-59 age group in 1985 and in the 80 and over group in 1987 (Figure 1). If the Cooperative Extension's program in Broome County had been uniformly effective, one would expect the 1987 average calcium intakes in Broome to be greater than those in Oneida for all age ranges. It is possible, however, that certain age groups were influenced more by the program than others.

Figure 2 shows average dairy calcium intakes subdivided by educational levels. A comparison of Broome and Oneida in each year shows only one statistically significant difference at the 90 percent level. This is found in the lowest education range in 1985, where the Broome County average was 158 mg greater than Oneida's average. No differences in 1987 were statistically significant. Again, the tremendous amount of variation in calcium intakes in each range makes statistical significance difficult to obtain. Average dairy calcium intakes in Broome County did increase relative to Oneida from 1985 to 1987 for three educational levels ("grade school," "graduated from high school," and "graduate school").

Looking across income ranges (Figure 3), the one statistically significant difference in 1987 occurred in the lowest income group. In that case, Broome County's average dairy calcium intake was 174 mg greater than Oneida's. No significant differences between the two counties occurred in 1985. During the period 1985 to 1987, Broome County's average dairy calcium intakes increased relative to Oneida in three of the four income ranges (<10,000, 20,000-30,000, and >30,000).

FIGURE 1 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION  
 OF WOMEN, BY AGE GROUPS,  
 BROOME & ONEIDA COUNTIES, 1985 & 1987

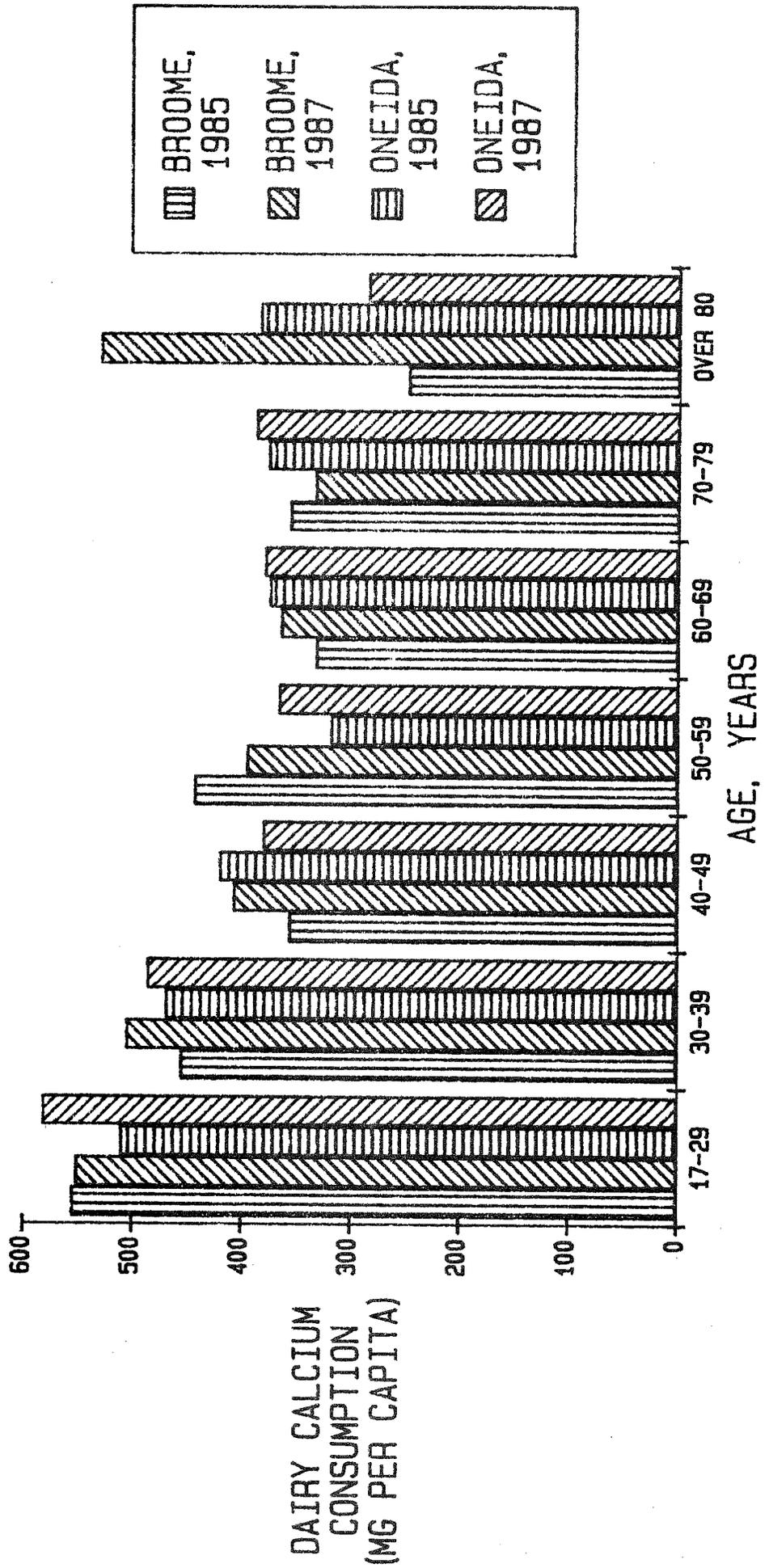


FIGURE 2 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION  
 OF WOMEN, BY EDUCATION,  
 BROOME & ONEIDA COUNTIES, 1985 & 1987

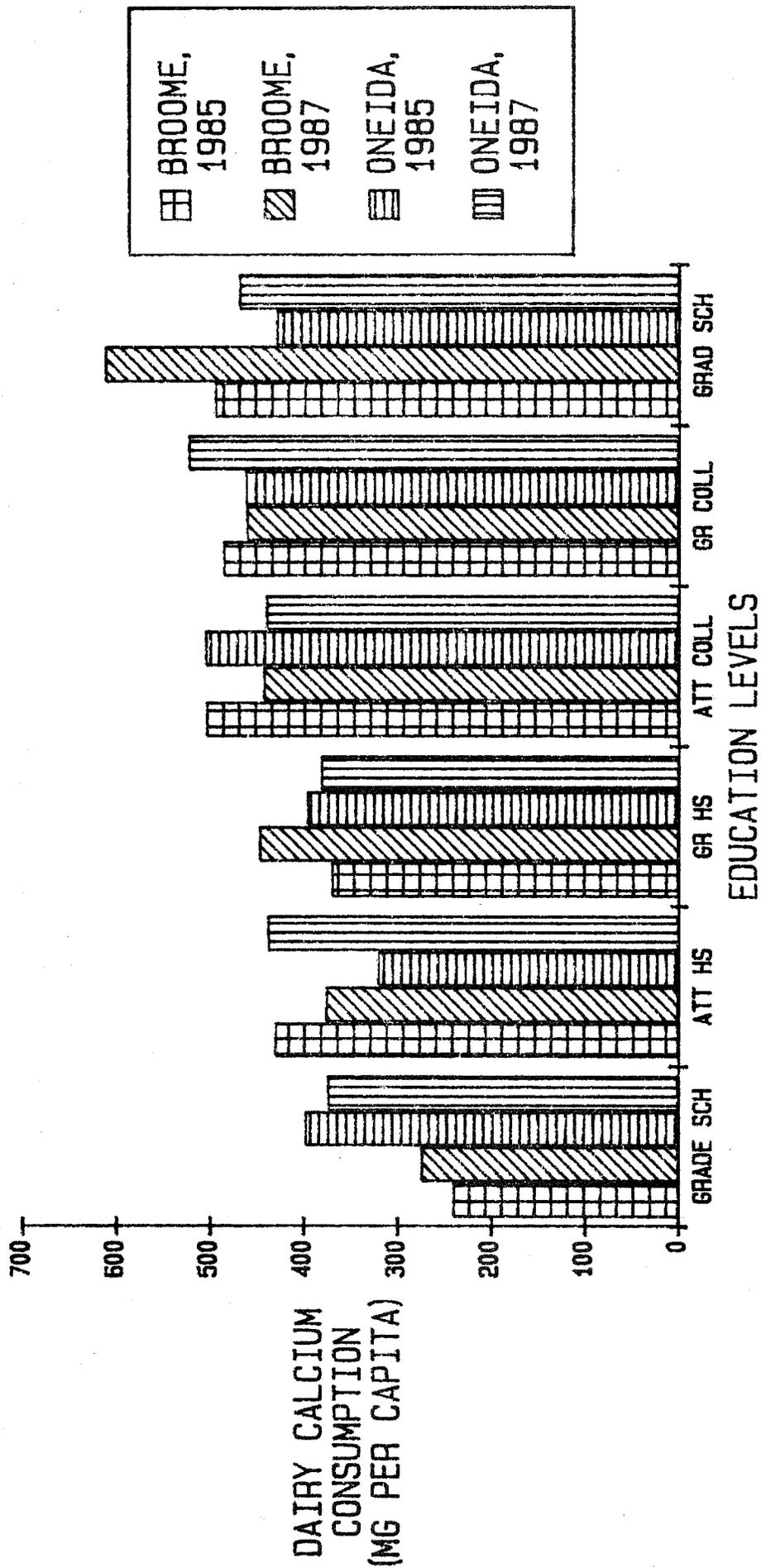


FIGURE 3 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION  
 OF WOMEN, BY INCOME LEVELS,  
 BROOME & ONEIDA COUNTIES, 1985 & 1987

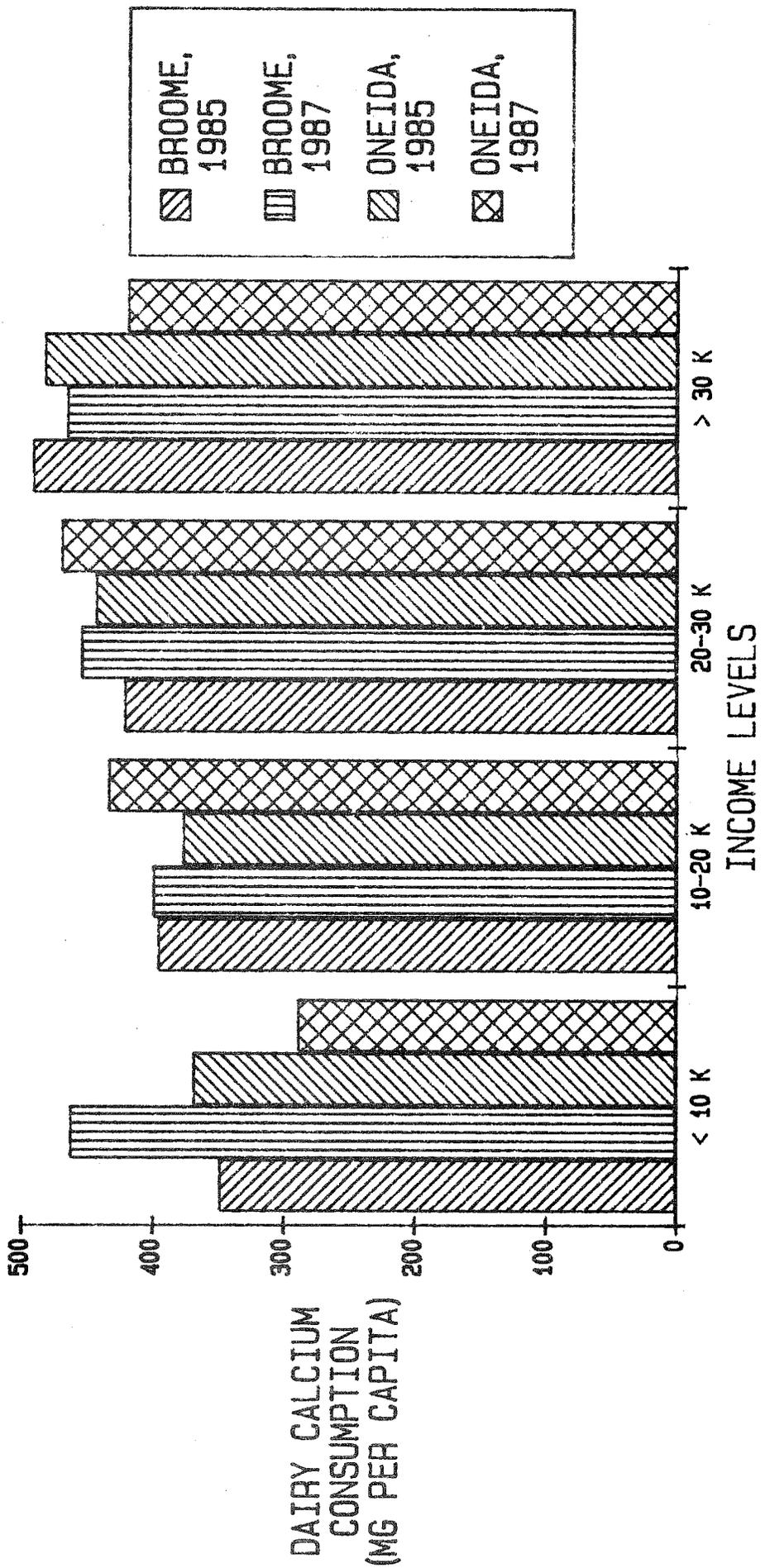


FIGURE 4 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION  
 OF WOMEN, BY PREGNANCY STATUS,  
 BROOME & ONEIDA COUNTIES, 1985 & 1987

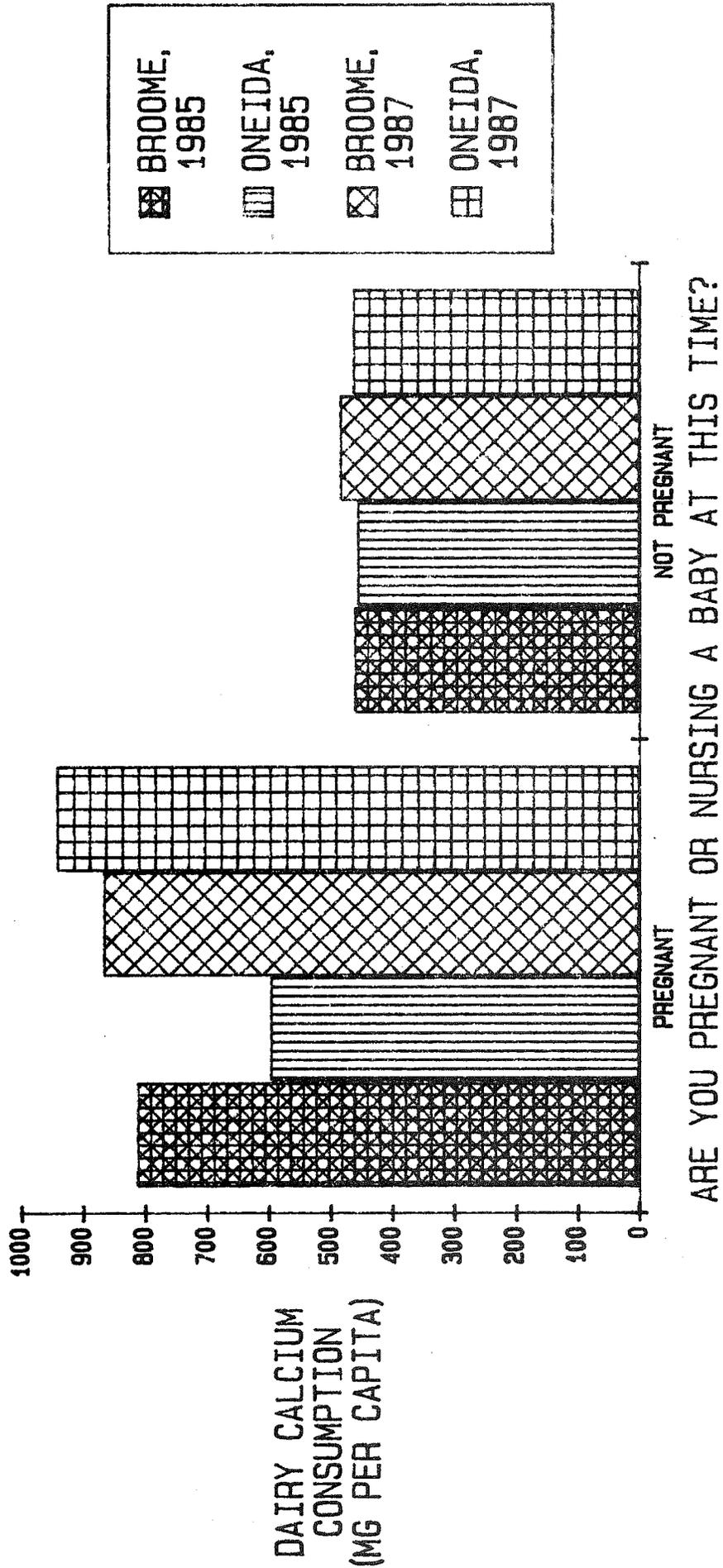


FIGURE 5 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION OF WOMEN, BY HOUSEHOLD SIZE, BROOME & ONEIDA COUNTIES, 1985 & 1987

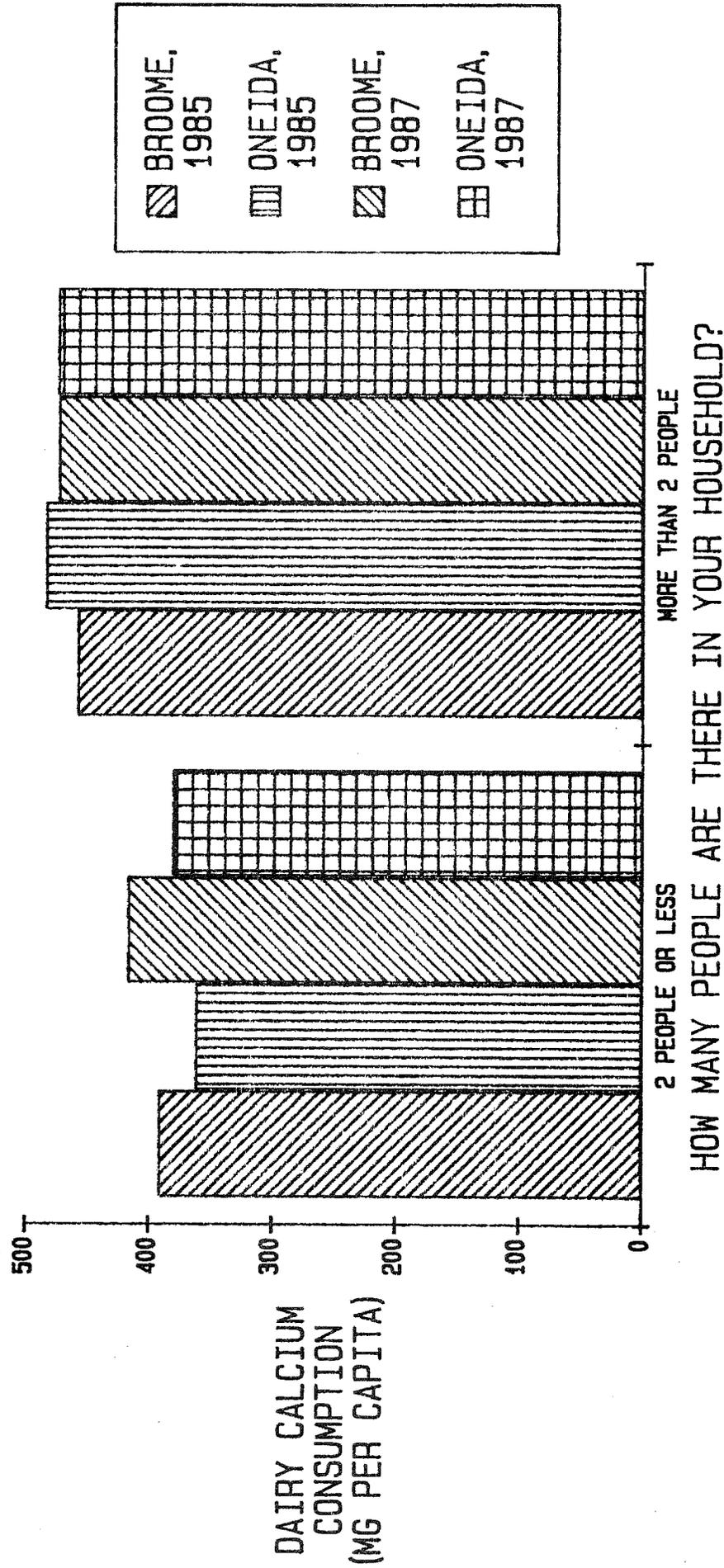


FIGURE 6 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION OF WOMEN, BY THE NORMALCY OF THEIR EATING PATTERNS, BROOME & ONEIDA COUNTIES, 1985 & 1987

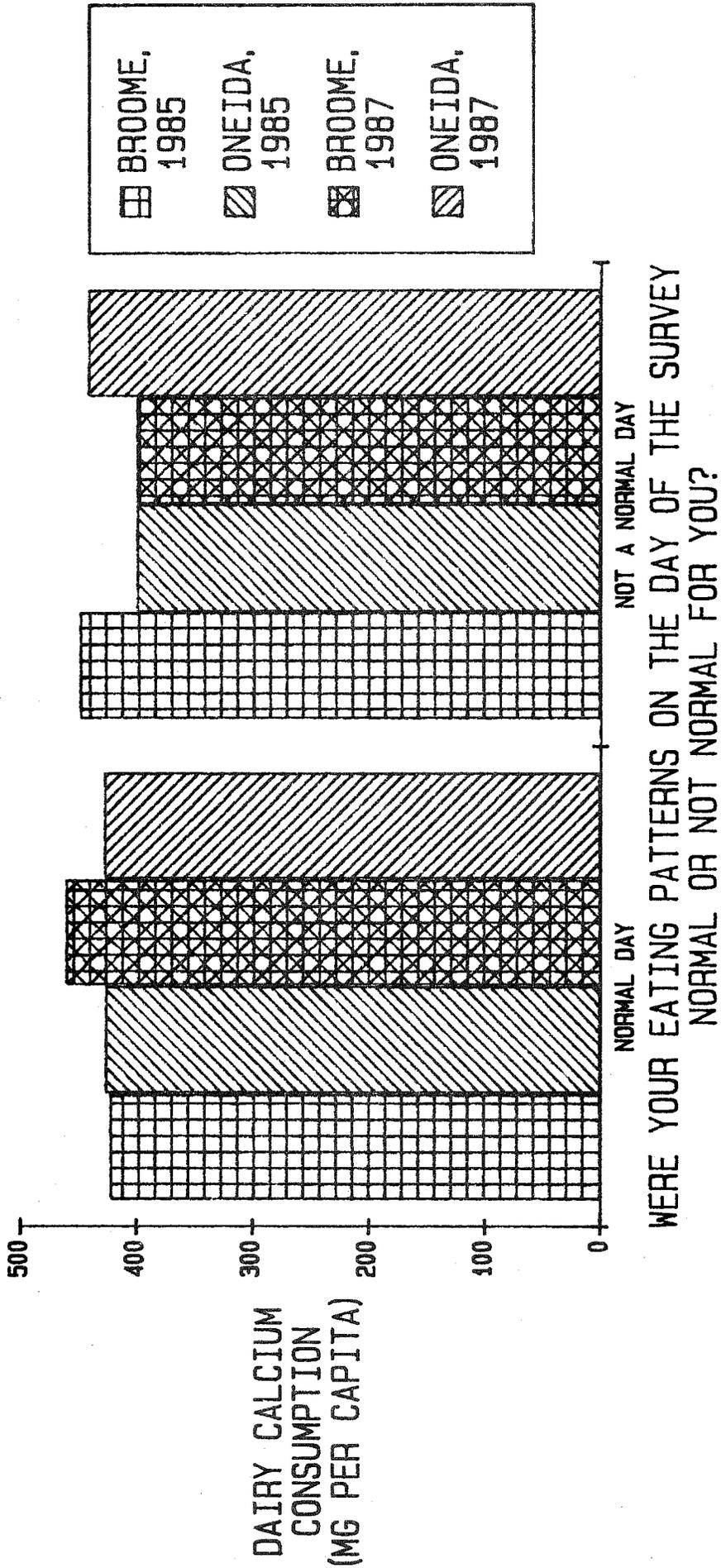
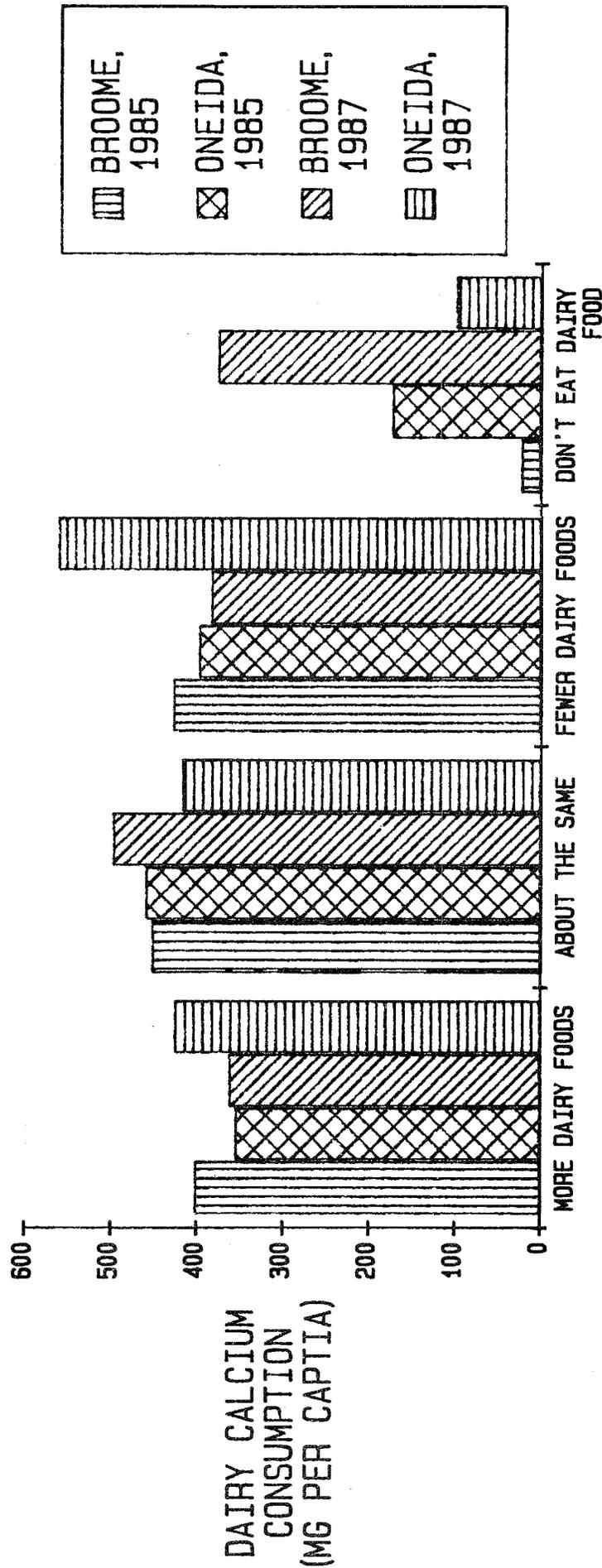
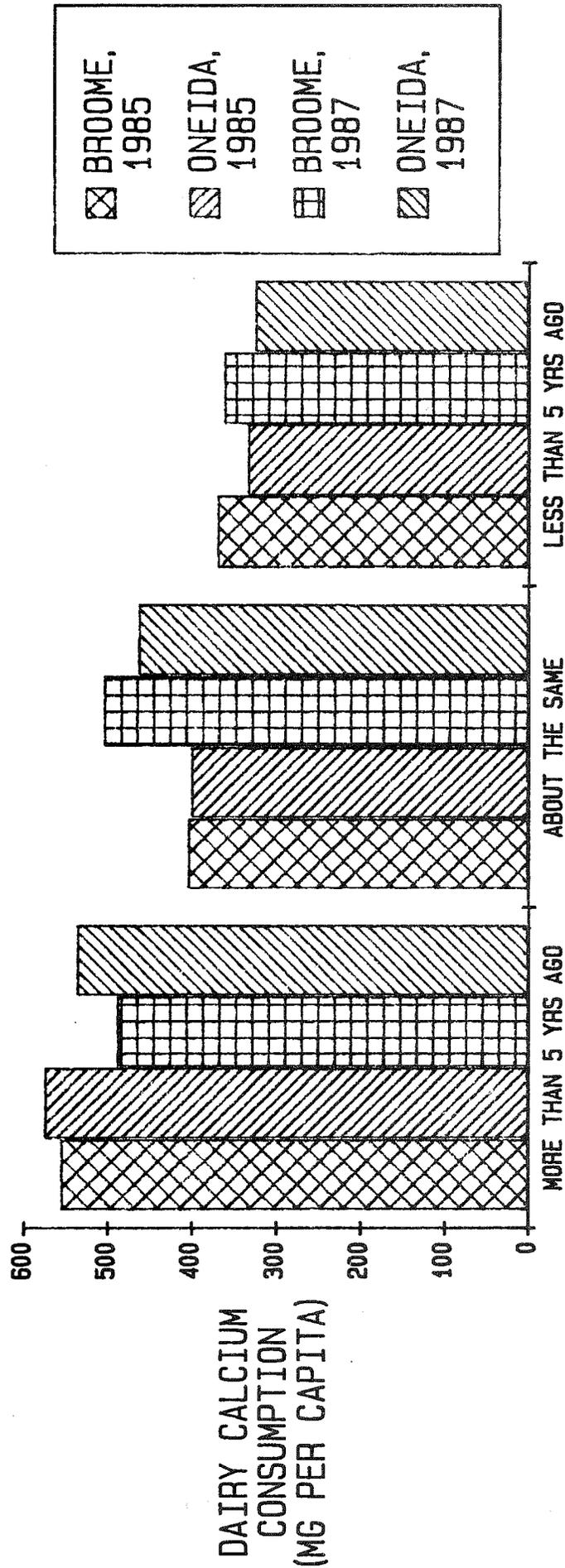


FIGURE 7 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION OF WOMEN, BY THE QUANTITY OF DAIRY FOODS USUALLY EATEN, BROOME & ONEIDA COUNTIES, 1985 & 1987



DO YOU USUALLY EAT MORE, ABOUT THE SAME, OR FEWER DAIRY PRODUCTS THAN YOU DID DURING THE 24-HOUR DIET RECALL?

FIGURE 8 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION OF WOMEN, COMPARING THEIR CURRENT DAIRY CONSUMPTION TO THAT OF 5 YEARS AGO, BROOME & ONEIDA COUNTIES, 1985 & 1987



COMPARED TO 5 YEARS AGO, DO YOU NOW EAT MORE DAIRY PRODUCTS ABOUT THE SAME NOW AS THEN, OR FEWER DAIRY PRODUCTS NOW?

FIGURE 9 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION OF WOMEN, BY LACTOSE INTOLERANCE, BROOME & ONEIDA COUNTIES, 1985 & 1987

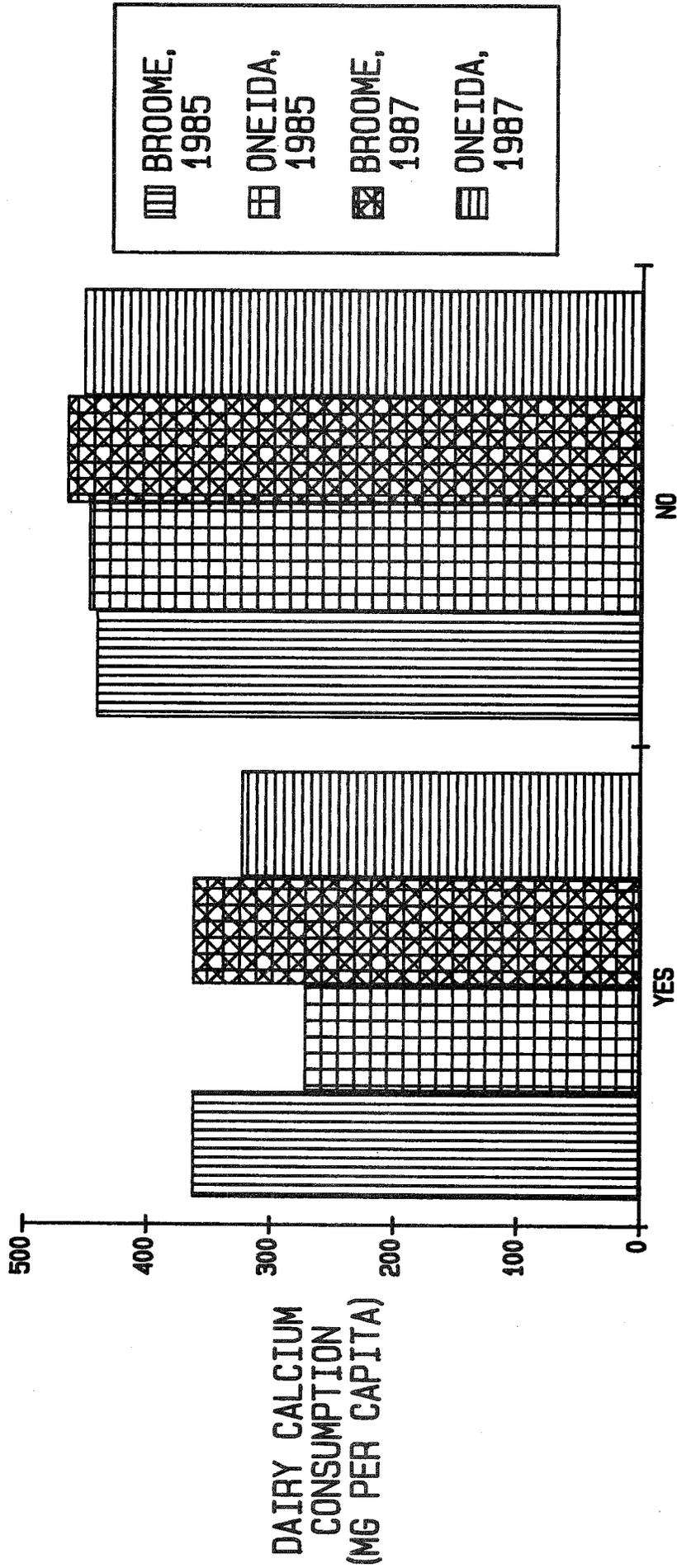


FIGURE 10 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION OF WOMEN, BY CALCIUM SUPPLEMENTATION, BROOME & ONEIDA COUNTIES, 1985 & 1987

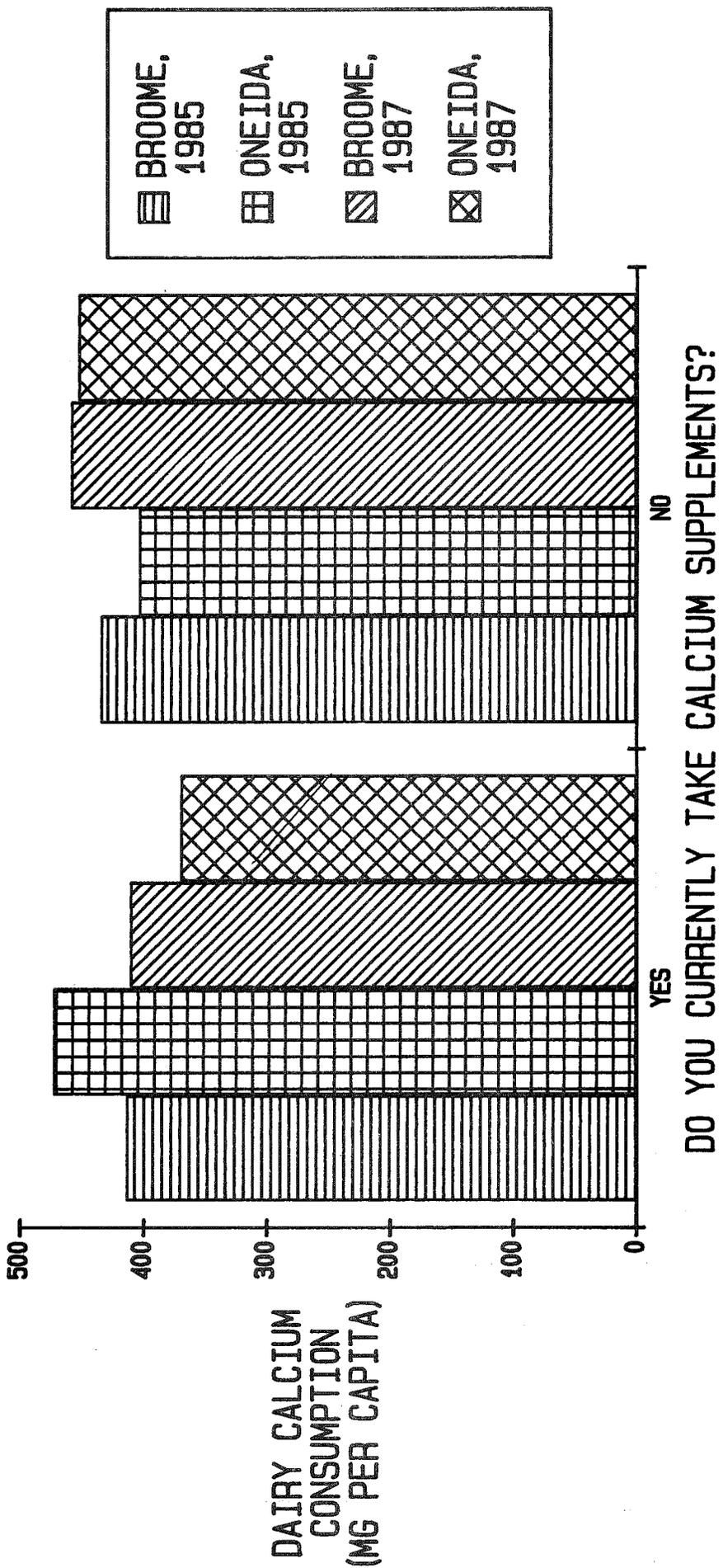
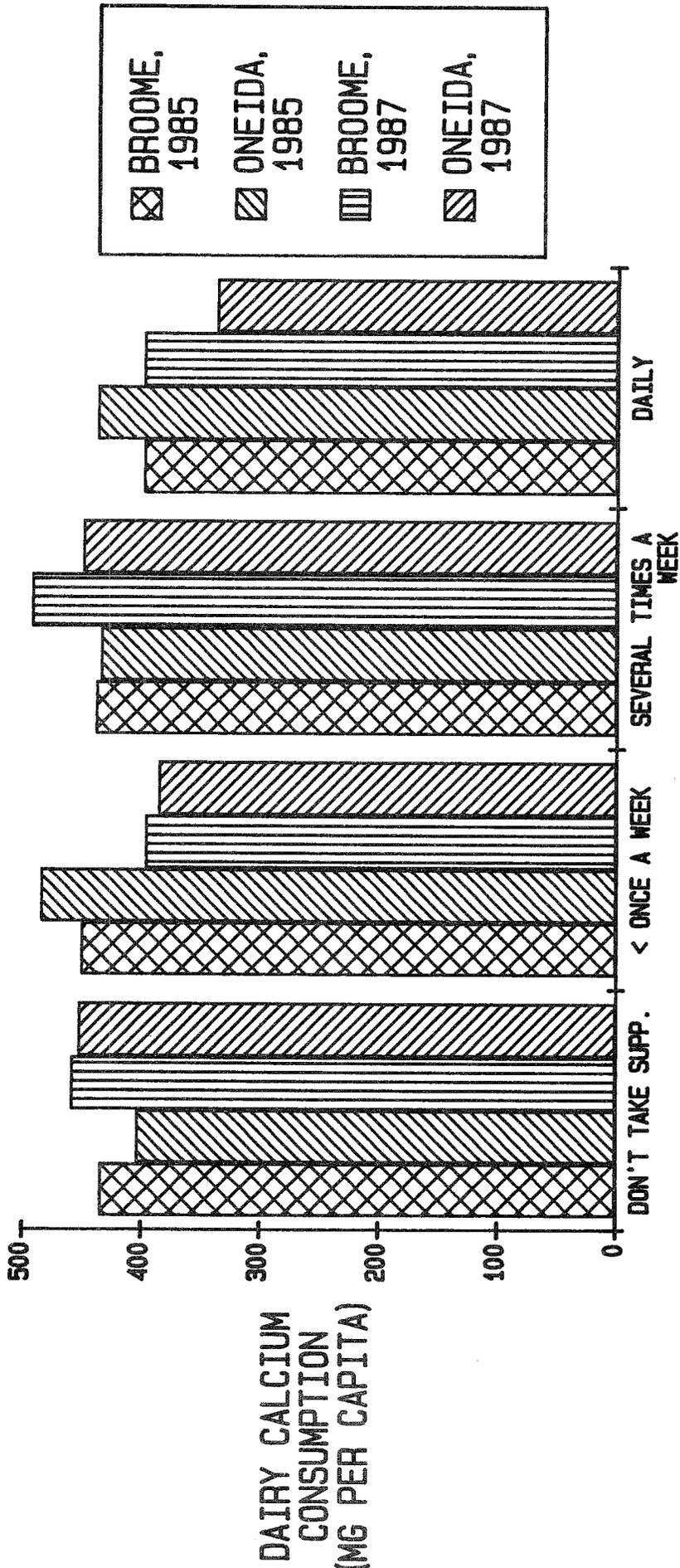


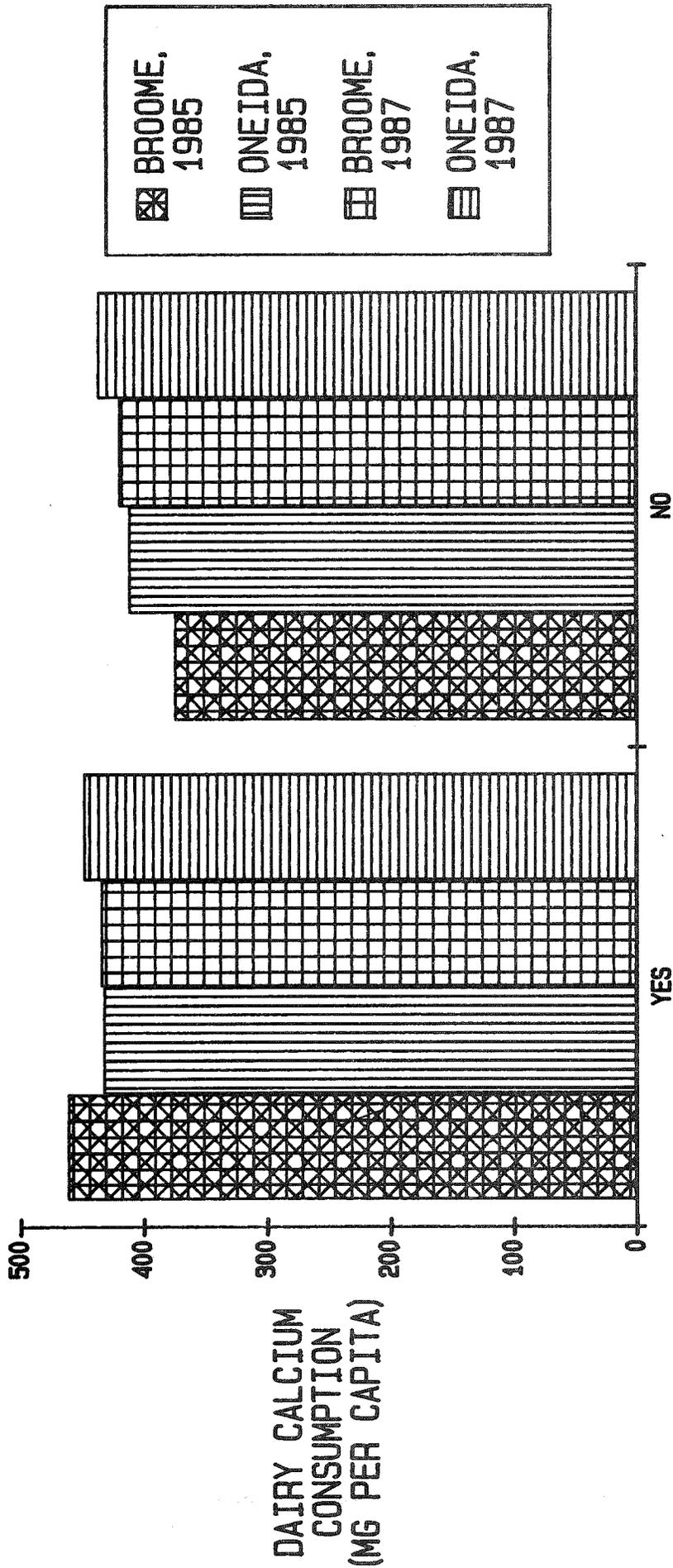
FIGURE 11 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION OF WOMEN, BY THE FREQUENCY OF CALCIUM SUPPLEMENTATION, BROOME & ONEIDA COUNTIES, 1985 & 1987



HOW OFTEN DO YOU TAKE YOUR CALCIUM SUPPLEMENTS?

DAIRY CALCIUM CONSUMPTION (MG PER CAPITA)

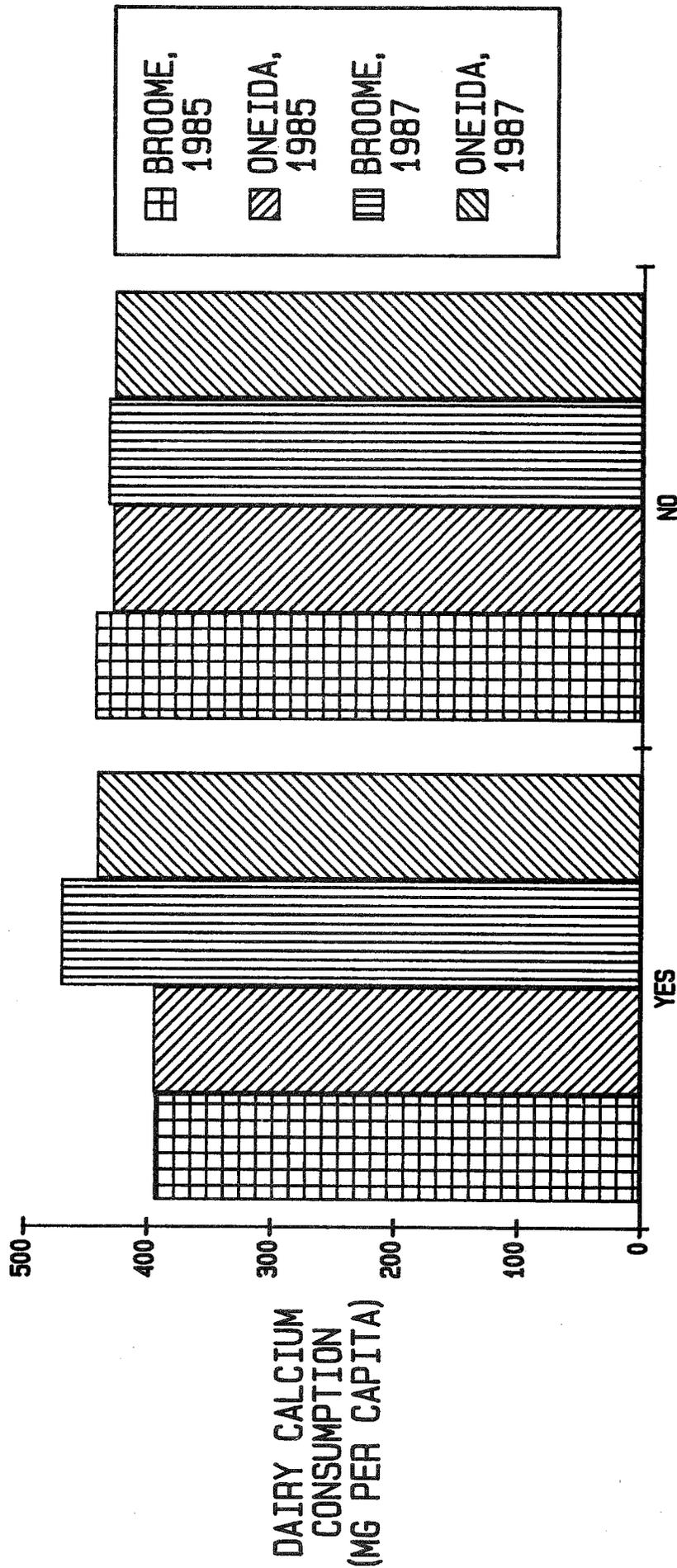
FIGURE 12 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION OF WOMEN, BY WHETHER THEY CONSIDER THE FAT CONTENT OF MILK OR NOT, BROOME & ONEIDA COUNTIES, 1985 & 1987



DO YOU CONSIDER THE FAT CONTENT OF MILK BEFORE YOU PURCHASE IT?

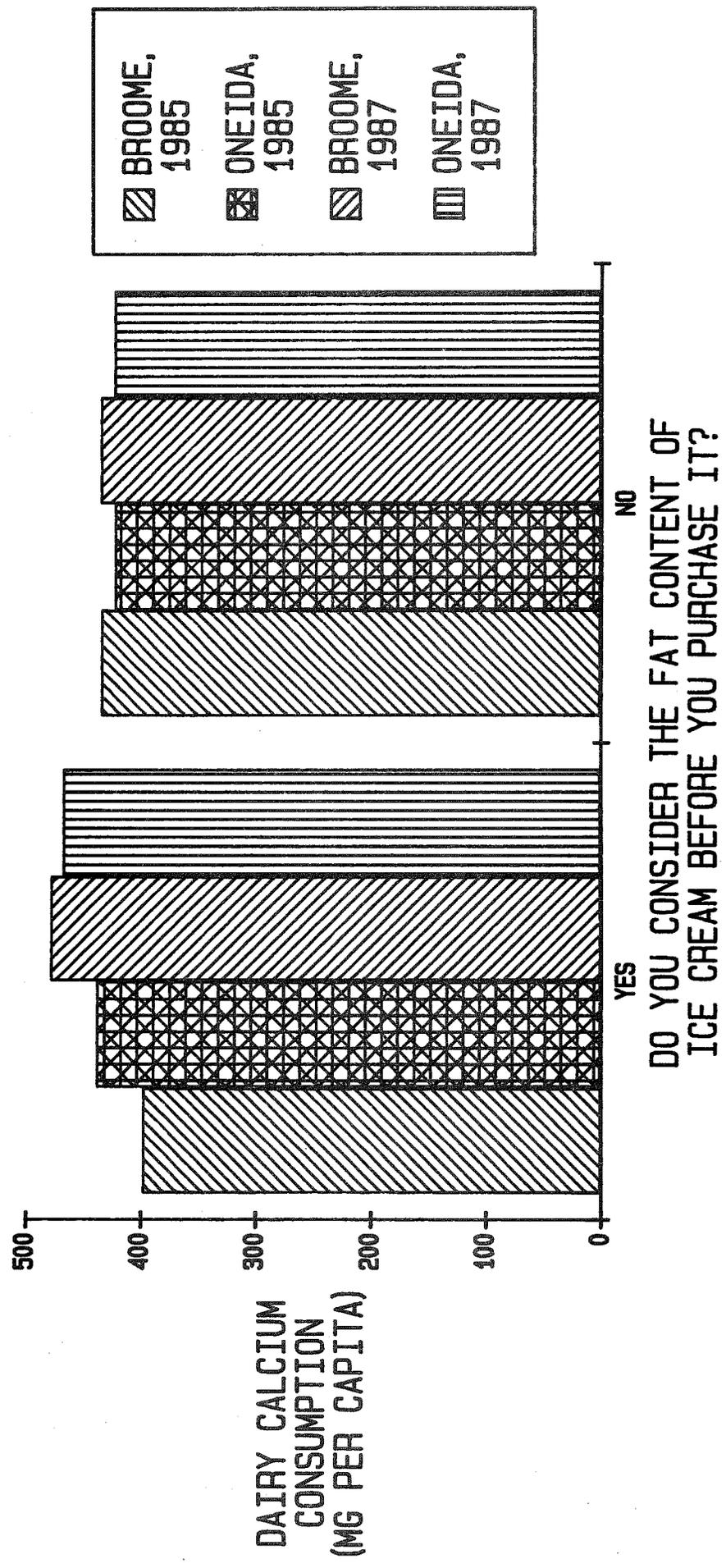
DAIRY CALCIUM CONSUMPTION (MG PER CAPITA)

FIGURE 13 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION OF WOMEN, BY WHETHER THEY CONSIDER THE FAT CONTENT OF CHEESE OR NOT, BROOME & ONEIDA COUNTIES, 1985 & 1987



DO YOU CONSIDER THE FAT CONTENT OF CHEESE BEFORE YOU PURCHASE IT?

FIGURE 14 - AVERAGE PER CAPITA DAIRY CALCIUM CONSUMPTION OF WOMEN, BY WHETHER THEY CONSIDER THE FAT CONTENT OF ICE CREAM OR NOT, BROOME & ONEIDA COUNTIES, 1985 & 1987



No significant differences in dairy calcium intakes occurred between counties in either survey year when subdivided by pregnancy status, household size, or "normalcy" of diet (Figures 4-6). There was a statistically significant difference (at the 99 percent level) among the comparisons of dairy food consumption on the day of the diet recall to the respondents' typical diet (Figure 7). This difference occurred in 1987 among those women saying their consumption of dairy foods during the diet recall was typical for them. In this case, Broome County's dairy calcium intake was 81 mg greater, supporting the hypothesis of increased calcium intake in Broome relative to Oneida. The other differences between counties in Figure 7 are not statistically significant (despite their large size) due to the smaller numbers of respondents in those groups and the large standard deviations (see Appendix 1 for complete tables). No other statistically significant differences between dairy calcium intakes in Broome and Oneida occurred when respondents were aggregated by comparing their current diet to their diet five years ago, lactose intolerance, calcium supplementation, or consideration of the amount of fat in milk, cheese, or ice cream (Figures 8-14). Thus, other than those differences cited here as statistically significant (at the 90 percent level or above), the differences between Broome and Oneida counties' dairy calcium intakes were due to random variation.

#### Determination of the Net Effect of Independent Factors on Dairy Calcium Consumption

Linear regression equations were calculated using the data sets from both surveys (a total of 1,421 observations). Three dummy variables were included in the equations: one for the two survey years, one for counties, and one specifically targeted towards the educational program sponsored by Cooperative Extension. Regression analysis allows the significance of each variable's effect on the dependent variable (dairy calcium intakes in this case) to be isolated. If the hypothesis that the dairy calcium education program in Broome County had a positive effect on residents' dairy calcium intakes is correct, the third dummy variable will be statistically significant and have a relatively large positive coefficient.

Seven outlying observations (calcium intake levels greater than 2,000 mg) were removed from the data sets as extreme values. The final equation contained age, education, lactose intolerance, pregnancy, comparison of the respondents' diet during the diet recall to their typical diet, consideration of the amount of fat in milk, and the three dummy variables. Income, household size, and calcium supplementation were originally included but dropped due to lack of statistical significance (t-scores less than 1.00).

Due to the cross-sectional nature of the data and the effects of unspecified factors such as individual tastes and preferences on dependent consumption variables of this type, it was not surprising to find that the equation explained only a small portion of the variation in dairy calcium intake. A logarithmic transformation of the dependent variable was tried, but this resulted in an even poorer fit. The "best" equation, based on goodness of fit and statistical measures including t-values and the F statistic, was specified as:

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 \dots + B_qX_q + e.$$

Where:

Y = per capita total dairy calcium intakes for respondents in both counties in both survey years.

$B_0$  = the intercept term.

$B_1 \dots B_q$  are the coefficients for the independent variables ( $X_1 \dots X_q$ ).

e = the error term.

The independent variables used in this equation were defined as:

$X_1$  = age of respondent, women age 18 and over

$X_2$  = 1, attended grade school, did not complete  
 2, completed grade school  
 3, attended high school, did not graduate  
 4, graduated from high school  
 5, attended college, did not graduate  
 6, graduated from college  
 7, attended graduate school, did not graduate  
 8, graduated from graduate school

$X_3$  = 1, lactose intolerant  
 0, not lactose intolerant

$X_4$  = 1, pregnant  
 0, not pregnant

$X_5$  = 1, ate more dairy foods than typically  
 0, ate about the same amount of dairy foods as usually  
 -1, ate fewer dairy foods than usual

$X_6$  = 1, did consider the fat content of milk before purchase  
 0, did not consider the fat content of milk

$X_7$  = 1 for 1987  
 0 for 1985

$X_8$  = 1 for Broome County  
 0 for Oneida County

$X_9$  = 1 for Broome County 1987  
 0 for Broome County 1985 and Oneida County 1985 and 1987

Age entered the equation as a continuous variable, ranging from 18 to 91. Based on previous research and results from the descriptive statistics, it was expected that this variable would be negative, indicating decreasing dairy calcium intakes as age increased. Education was a categorical variable, ranging from one for attending but not completing grade school to eight for graduating from graduate school. The  $B_2$  coefficient measures the effect of increasing amounts of education on dairy calcium intakes and was expected to be positive. Lactose intolerance was also treated as a categorical variable, with the  $B_3$  coefficient acting as a measure of the impact lactose intolerance has on dairy calcium consumption. This variable

was expected to be negative as lactose intolerance prevents proper digestion of most dairy products. The  $B_4$  coefficient for pregnancy was expected to be positive to indicate the additional amount of dairy calcium consumed by pregnant or nursing mothers.

The coding of the "what's normal" variable ( $X_5$ ) was 1 if they ate more dairy foods on the day of the interview than they usually did, 0 if they ate the same amount of dairy foods as usual, and -1 if they ate fewer dairy foods on the day of the interview than was typical for them. It was expected that this variable would be positive as those who consumed more dairy products than usual (coded 1) would be expected to have a higher dairy calcium intake than those who consumed fewer than usual (coded -1). The milkfat variable was coded as 0 if the respondent didn't usually consider the fat content of milk before purchase, and as a 1 if she did. Thus, the  $B_6$  coefficient measures the extent to which dairy calcium consumption varied by whether the respondent considered the fat content of milk or not. There were no a priori expectations for the sign of this variable, although descriptive statistics indicated that there was no negative effect.

The dummy variables,  $X_7$ ,  $X_8$ , and  $X_9$ , were used to isolate the effects on dairy calcium intakes solely due to survey year and county. The coefficient for  $X_7$  indicates the extent to which changes in dairy calcium intakes occurred between 1985 and 1987, net the effects of other factors already included in the equation. It was expected to be positive due to the influence of calcium advertising and promotion over time. The coefficient for  $X_8$  is an indicator of any unique differences which exist between Broome and Oneida counties, net other factors. No a priori expectations were held for its sign, as the counties were chosen as equals initially.

The  $X_9$  coefficient measures any difference found solely in dairy calcium intakes from Broome County in 1987. This coefficient in effect measures the impact of the calcium education and promotion program in Broome County on dairy calcium consumption and is a direct indicator of the correctness of the original hypothesis. If the hypothesis is true, the variable will have a significant and positive sign, indicating that the calcium education program in Broome County had a positive effect on dairy calcium intakes, net all other factors.

The equation was estimated as (t-scores in parentheses):

$$Y = 520 - 2.78X_1 + 7.47X_2 - 82.38X_3 + 277.12X_4 + 71.24X_5 + 38.46X_6 +$$

(11.17) (-4.98) (1.36) (-3.29) (6.11) (-3.75) (1.95)

$$7.07X_7 + 2.26X_8 + 1.25X_9$$

(0.27) (0.09) (0.03)

The adjusted  $R^2$  for 1,421 degrees of freedom is .070, with an F-ratio of 12.9.

### Interpretation of the Results

Considering it is based on cross-sectional consumption data, a small  $R^2$  was not unexpected. The high F-ratio (12.91, statistically significant at the 99 percent level) indicates that these variables in combination are

all significant predictors of calcium intakes. This is borne out by the t-values on each individual variable. Other than for the dummy variables, all are highly significant. Of the various functional forms and variable combinations tried, this equation was the strongest.

**Age ( $X_1$ ).** The sign of the age coefficient is negative, as expected. For every year increase in age, it was estimated that respondents decreased their dairy calcium intake by 3 mg. To determine the total effect of age on dairy calcium consumption, the respondent's age must be multiplied by -2.78. For example, a 50-year-old woman would consume 70 mg less dairy calcium per day than a 25-year-old woman [(50-25) (-2.78)] assuming all other factors in the equations remained the same.

**Education ( $X_2$ ).** The sign on the education coefficient is positive, as expected, and indicates that the more formal education a woman has, the more dairy products she is likely to consume. The magnitude of the coefficient is such that a person who graduated from high school is estimated to consume 7 more milligrams of dairy calcium than a woman who attended but did not graduate from high school. At the extreme, a woman with a graduate degree may consume 60 mg more calcium than a woman who attended but did not finish grade school (7.47 x 8).

**Lactose Intolerance ( $X_3$ ).** The negative sign on this variable is as expected. A woman who is lactose intolerant (and therefore has difficulty in digesting many dairy products) will consume on average 82 mg less dairy calcium per day than a woman who is not lactose intolerant. This is slightly more calcium than found in one-quarter of a cup of whole milk.

**Pregnancy ( $X_4$ ).** The relatively large positive coefficient on this variable indicates that women who are pregnant or breastfeeding consume significantly more dairy products than women who are not pregnant or nursing. This is as expected. Of the women surveyed, those that were pregnant or nursing were estimated to consume 277 mg more calcium than their nonpregnant counterparts.

**Typical Diet ( $X_5$ ).** This variable also had a positive sign on the coefficient, as expected. Those who reported consuming more dairy foods during the diet recall than usual consumed on average 71 mg more dairy calcium than did those who said they ate the same amount of dairy foods as usual. Those reporting eating less dairy products than usual are estimated to consume 71 mg less dairy calcium than those who said they consumed their typical amount that day.

**Consideration of the Fat Content of Milk ( $X_6$ ).** Over 60 percent of respondents in both survey years indicated that they considered the fat content of milk before they purchased it. The positive sign on the coefficient indicates that those who do consider the fat content also consume more dairy calcium (approximately 38 mg). As there were no a priori expectations for this variable, this is not as contradictory as it may seem.

The dependent variable is dairy calcium, not dairy fat, so that a woman who is health conscious may be aware of both the need for calcium in her diet and the need to limit saturated fats. With this in mind, she might select lowfat or skim milk, thus consuming dairy calcium while still considering the fat content of the milk.

**Year Effect ( $X_7$ ).** This variable had a positive sign as expected, indicating a possible increase in dairy calcium consumption, net of all other factors, over the two years of the study. However, the coefficient itself is small and statistically not significant. Thus, if there was any increase in average dairy calcium intakes due solely to the passage of time, it was likely a very modest one.

**County Effect ( $X_8$ ).** For this variable there were no a priori expectations as to its sign since both counties were believed to have similar consumption patterns. The sign was positive, but the coefficient and t-score were both quite small. The lack of statistical significance (reflected by the low t-score) indicates that women in the two counties did have similar dairy product consumption patterns, net of other factors.

**Effect of Broome County Calcium Education Program ( $X_9$ ).** It was not possible to maintain Oneida County strictly as a control county with the only difference between them being the expanded calcium education program in Broome. Women in Broome County were exposed to a somewhat larger and more extensive calcium education program than were women in Oneida, however. It is the effect (if any) of this larger calcium program on Broome County's dairy calcium consumption that  $B_9$  attempts to measure. The sign on the variable is positive, which is as expected. However, the coefficient is small and not statistically significant. This indicates that any gain in dairy calcium intakes among women in Broome County was due to random variation and cannot be attributed to the dairy calcium education programs there. Thus, it must be concluded that either the calcium education efforts in Broome County did not have an impact large enough to measure or that the programs themselves were not large enough or extensive enough to have a measurable impact. Another possibility is that the women most affected by the educational programming, those receiving one-to-one interaction with paraprofessionals, were not adequately represented in this survey to determine the effect of the programs on them alone.

#### SUMMARY AND CONCLUSIONS

"Before" and "after" surveys of dairy product consumption were administered to women in Broome and Oneida counties in New York State. The purpose of these surveys was to determine if a special calcium education program sponsored by Cooperative Extension in Broome County had a significant effect on the consumption of dairy products by women in that county. In 1985, the average per capita dairy calcium intake was 427 mg in Broome County and 421 mg in Oneida County. These figures rose to 445 mg in Broome and to 431 mg in Oneida in 1987, but the increases were not

statistically significant in either county, nor were the calcium levels in the counties statistically different.

In each survey, dairy calcium consumption was correlated positively with education, income, pregnancy, and household size, and negatively with age and lactose intolerance. Approximately 50 percent of the women in each survey lived alone or with one other person. Between 1985 and 1987, the number of respondents believing they eat fewer dairy foods now than five years ago rose, while the number believing that their dairy food consumption has increased over the last five years decreased.

Lactose intolerance was reported by approximately 17 percent of the respondents in each year. The percentage of women taking calcium supplements in each county rose from 25 percent in 1985 to 28 percent in 1987, with the majority taking the supplements at least once a day or more. Over 70 percent of the women surveyed in 1987 said they considered the fat content of fluid milk before they purchased it, up from 60 percent from 1985. The percentages of women considering the fat content of cheese and ice cream in 1987 rose to 29 percent and 23 percent respectively. The total number of dairy foods reported consumed also rose in 1987 to 2,303, for an average of three dairy foods consumed per capita during the 24-hour diet recall.

Ordinary least squares (OLS) regression analysis was performed using the combined data from the two surveys, with average dairy calcium intake as the dependent variable and nine independent variables (age, education, lactose intolerance, pregnancy, a comparison of dairy product consumption during the diet recall to the amount of dairy foods consumed "typically," concern about the amount of fat in milk, and three dummy variables, one for the survey year, one distinguishing the two counties, and one singling out Broome County in 1987). A low  $R^2$  but highly significant t-scores and F tests were among the results from the estimation. These facts indicate that while the independent variables used are important predictors of dairy calcium consumption, other factors, including individual tastes and preferences, are responsible for most of the variation among individuals.

The signs and magnitudes of the various coefficients in the regression equation were as expected. Each of the variables and the overall F-test were highly significant (other than the dummy variables). This indicates that the model used in the analysis is reasonable and that the independent variable coefficients provide realistic measures of the direction and magnitude of the variables' impact on women's per capita dairy calcium consumption.

The answer to the basic question posed is negative. No significant increase in Broome County's overall dairy calcium intake was found either with descriptive statistics or through regression analysis. Either the special calcium education program in Broome County did not have a large enough impact to be measured, or the program itself was not large enough to produce a measurable impact on dairy calcium consumption. Studying only women who were exposed to the intensive one-on-one programming, rather than the county as a whole, might have been another way to examine this issue.

These results hold implications for future programs. It is concluded that nutrition education programs of the type and size sponsored in Broome

County, even when supplemented by local Dairy Council programs, are not likely to have a measurable effect on consumption of specific products by large population groups. However, it is possible that programs that are larger, better organized, and directed more specifically at the products being promoted could be effective.

APPENDIX 1

Table A1. Mean Dairy Calcium Consumption of Women, by Age Groups, 1985

Age	<u>Observations</u>		<u>Calcium</u>	Std. Dev. (mg)	t-score <sup>1</sup>
	No.	Percent	<u>Consumption</u> Mean (mg)		
<u>Broome County</u>					
17-29	89	23	556	471	
30-39	89	23	456	380	
40-49	50	13	357	285	
50-59	54	14	444	353	
60-69	54	14	333	247	
70-79	34	9	357	293	
80+	13	3	249	222	
<u>Oneida County</u>					
17-29	65	18	511	383	.628
30-39	71	20	470	359	.239
40-49	64	18	421	365	1.020
50-59	40	11	319	258	1.886*
60-69	64	18	376	554	.526
70-79	44	12	377	380	.245
80+	11	3	385	402	1.052

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between Broome and Oneida counties for each age group in 1985.

\* Statistically significant at the 90 percent level.

Table A2. Mean Dairy Calcium Consumption of Women, by Age Groups, 1987

Age	<u>Observations</u>		<u>Calcium</u>	Std. Dev. (mg)	t-score <sup>1</sup>
	No.	Percent	Consumption Mean (mg)		
<u>Broome County</u>					
17-29	67	17	552	514	
20-39	94	24	506	484	
40-49	64	17	408	375	
50-59	55	14	396	326	
60-69	55	14	365	328	
70-79	38	10	334	302	
80+	10	3	531	324	
<u>Oneida County</u>					
17-29	53	14	583	504	.338
30-39	89	24	487	389	.282
40-49	69	18	381	370	.424
50-59	51	14	367	350	.436
60-69	58	15	380	319	.251
70-79	47	13	388	285	.853
80+	9	2	286	358	1.565

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between Broome and Oneida counties for each age group in 1987.

Table A3. Mean Dairy Calcium Consumption of Women, by Education, 1985

Education <sup>1</sup>	<u>Observations</u>		<u>Calcium</u>	<u>Std.</u>	t-score <sup>2</sup>
	No.	Percent	<u>Consumption</u>	<u>Dev.</u>	
			Mean (mg)	(mg)	
<u>Broome County</u>					
1	25	7	241	187	
2	39	10	431	336	
3	142	37	371	321	
4	68	18	505	425	
5	73	19	487	390	
6	36	9	496	444	
<u>Oneida County</u>					
1	29	8	399	446	1.650*
2	38	10	322	277	1.553
3	125	35	397	331	.640
4	58	16	506	543	.013
5	76	21	463	401	.377
6	29	8	430	457	.589

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985.

- <sup>1</sup> 1 = attended grade school or graduated from grade school  
 2 = attended high school  
 3 = graduated from high school  
 4 = attended college or technical school  
 5 = graduated from college or technical school  
 6 = attended graduate school or graduated from graduate school

<sup>2</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between Broome and Oneida counties for each education level in 1985.

\* Statistically significant at the 90 percent level.

Table A4. Mean Dairy Calcium Consumption of Women, by Education, 1987

Education <sup>1</sup>	<u>Observations</u>		<u>Calcium</u>	<u>Std.</u>	t-score <sup>2</sup>
	No.	Percent	<u>Consumption</u>	<u>Dev.</u>	
			Mean (mg)	(mg)	
<u>Broome County</u>					
1	13	3	275	255	
2	38	10	377	353	
3	96	25	448	408	
4	109	29	444	352	
5	85	22	462	393	
6	46	12	445	394	
<u>Oneida County</u>					
1	21	6	375	221	1.203
2	35	9	439	363	.746
3	98	26	382	380	1.168
4	108	30	441	356	.071
5	58	15	524	485	.836
6	40	11	470	381	1.084

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1987.

- <sup>1</sup> 1 = attended grade school or graduated from grade school  
 2 = attended high school  
 3 = graduated from high school  
 4 = attended college or technical school  
 5 = graduated from college or technical school  
 6 = attended graduate school or graduated from graduate school

<sup>2</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between Broome and Oneida counties for each education level in 1987.

Table A5. Mean Dairy Calcium Consumption of Women, by Income Levels, 1985

Income <sup>1</sup>	<u>Observations</u>		<u>Calcium</u>	Std. Dev. (mg)	t-score <sup>2</sup>
	No.	Percent	<u>Consumption</u> Mean (mg)		
<u>Broome County</u>					
1	50	13	349	282	
2	87	22	396	341	
3	76	19	422	362	
4	139	36	492	414	
<u>Oneida County</u>					
1	61	17	369	350	.317
2	91	25	377	315	.385
3	89	25	444	383	.380
4	100	28	483	500	.165

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985.

- <sup>1</sup> 1 = household income less than \$10,000  
 2 = household income between \$10,000 and \$19,000  
 3 = household income between \$20,000 and \$30,000  
 4 = household income greater than \$30,000

<sup>2</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between Broome and Oneida counties for each income level in 1985.

Table A6. Mean Dairy Calcium Consumption of Women, by Income Levels, 1987

Income <sup>1</sup>	Observations		Calcium Consumption Mean (mg)	Std. Dev. (mg)	t-score <sup>2</sup>
	No.	Percent			
<u>Broome County</u>					
1	43	11	463	454	
2	81	21	400	310	
3	74	19	455	399	
4	164	43	466	463	
<u>Oneida County</u>					
1	32	9	289	306	1.874*
2	77	20	434	374	.628
3	98	26	470	356	.265
4	149	40	420	364	.969

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1987.

- <sup>1</sup> 1 = household income less than \$10,000  
 2 = household income between \$10,000 and \$19,000  
 3 = household income between \$20,000 and \$30,000  
 4 = household income greater than \$30,000

<sup>2</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between Broome and Oneida counties for each income level in 1987.

\* Statistically significant at the 90 percent level.

Table A7. Mean Dairy Calcium Consumption of Women, by Pregnancy Status, 1985 and 1987

Pregnancy Status	<u>Observations</u>		<u>Calcium</u>	Std. Dev. (mg)	t-score <sup>1</sup>
	No.	Percent	<u>Consumption</u> Mean (mg)		
<u>1985</u>					
<u>Broome County</u>					
Were pregnant	16	2	813	556	
Were not pregnant	374	50	411	350	
<u>Oneida County</u>					
Were pregnant	18	2	597	312	1.418
Were not pregnant	344	46	411	404	.031
<u>1987</u>					
<u>Broome County</u>					
Were pregnant	16	2	867	458	
Were not pregnant	366	48	428	405	
<u>Oneida County</u>					
Were pregnant	15	2	943	458	.362
Were not pregnant	357	47	409	348	.698

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985 and 1987.

Table A8. Mean Dairy Calcium Consumption of Women, by Household Size, 1985 and 1987

Household Size	<u>Observations</u>		<u>Calcium</u>	<u>Std.</u>	t-score <sup>1</sup>
	No.	Percent	<u>Consumption</u>	<u>Dev.</u>	
			Mean (mg)	(mg)	
<u>1985</u>					
<u>Broome County</u>					
2 people or fewer	172	23	392	348	
More than 2 people	216	29	458	382	
<u>Oneida County</u>					
2 people or fewer	188	25	362	353	.826
More than 2 people	174	23	484	440	.617
<u>1987</u>					
<u>Broome County</u>					
2 people or fewer	198	26	417	400	
More than 2 people	187	25	474	430	
<u>Oneida County</u>					
2 people or fewer	175	23	381	325	.964
More than 2 people	201	27	475	422	.019

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985 and 1987.

Table A9. Mean Dairy Calcium Consumption of Women, by Normalcy of Respondent's Eating Patterns on the Day of the Diet Recall, 1985 and 1987

Eating Habits on the Survey Day	<u>Observations</u>		<u>Calcium</u> <u>Consumption</u>	<u>Std.</u> <u>Dev.</u>	t-score <sup>1</sup>
	No.	Percent	Mean (mg)	(mg)	
<u>1985</u>					
<u>Broome County</u>					
Ate as usual	299	40	423	364	
Ate unusually	90	12	449	484	
<u>Oneida County</u>					
Ate as usual	259	34	427	419	.145
Ate unusually	102	14	400	357	.906
<u>1987</u>					
<u>Broome County</u>					
Ate as usual	291	38	461	419	
Ate unusually	93	12	400	401	
<u>Oneida County</u>					
Ate as usual	286	38	428	354	1.022
Ate unusually	90	12	442	462	.655

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985 and 1987.

Table A10. Mean Dairy Calcium Consumption of Women, Comparing Their Normal Diets With What They Ate the Day of the Interview, 1985

Respondents Normally Would	<u>Observations</u>		<u>Calcium</u> <u>Consumption</u>	Std. Dev. (mg)	t-score <sup>1</sup>
	No.	Percent	Mean (mg)		
<u>Broome County</u>					
Eat more dairy foods	118	16	402	361	
Eat about the same amount	228	30	452	370	
Eat fewer dairy foods	38	5	427	377	
<u>Oneida County</u>					
Eat more dairy foods	105	14	355	339	1.003
Eat about the same amount	218	29	459	429	.196
Eat fewer dairy foods	32	4	397	393	.323

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985.

Table All. Mean Dairy Calcium Consumption of Women, Comparing Their Normal Diets With What They Ate the Day of the Interview, 1987

Respondents Normally Would	<u>Observations</u>		<u>Calcium</u> <u>Consumption</u>	Std. Dev.	t-score <sup>1</sup>
	No.	Percent	Mean (mg)	(mg)	
<u>Broome County</u>					
Eat more dairy foods	110	15	362	386	
Eat about the same amount	230	30	497	422	
Eat fewer dairy foods	35	5	383	339	
<u>Oneida County</u>					
Eat more dairy foods	103	14	425	407	1.162
Eat about the same amount	226	30	416	320	2.306*
Eat fewer dairy foods	42	6	560	576	1.602

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1987.

\* Statistically significant at the 90 percent level.

Table A12. Mean Dairy Calcium Consumption of Women, Comparing Their Dairy Product Consumption of Five Years Ago to Their Current Dairy Product Consumption, 1985

Respondents Currently	<u>Observations</u>		<u>Calcium</u> <u>Consumption</u>	Std. Dev.	t-score <sup>1</sup>
	No.	Percent	Mean (mg)	(mg)	
<u>Broome County</u>					
Eat more dairy foods	94	12	556	445	
Eat about the same amount	168	22	405	342	
Eat fewer dairy foods	125	17	370	316	
<u>Oneida County</u>					
Eat more dairy foods	82	11	575	521	.253
Eat about the same amount	171	23	401	346	.126
Eat fewer dairy foods	106	14	334	340	.835

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985.

Table A13. Mean Dairy Calcium Consumption of Women, Comparing Their Dairy Product Consumption of Five Years Ago to Their Current Dairy Product Consumption, 1987

Respondents Currently	<u>Observations</u>		<u>Calcium</u> <u>Consumption</u>	Std.	t-score <sup>1</sup>
	No.	Percent	Mean (mg)	Dev. (mg)	
<u>Broome County</u>					
Eat more dairy foods	71	9	489	493	
Eat about the same amount	161	21	505	433	
Eat fewer dairy foods	153	20	362	338	
<u>Oneida County</u>					
Eat more dairy foods	81	11	537	496	.592
Eat about the same amount	165	22	464	389	.900
Eat fewer dairy foods	128	17	325	247	1.010

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1987.

Table A14. Mean Dairy Calcium Consumption of Women, by Lactose Intolerance, 1985 and 1987

Lactose Intolerant	Observations		Calcium Consumption Mean (mg)	Std. Dev. (mg)	t-score <sup>1</sup>
	No.	Percent			
<u>1985</u>					
<u>Broome County</u>					
No	324	43	442	366	
Yes	64	8	363	373	
<u>Oneida County</u>					
No	306	41	448	409	.187
Yes	55	7	272	325	1.403
<u>1987</u>					
<u>Broome County</u>					
No	308	40	466	429	
Yes	77	10	363	344	
<u>Oneida County</u>					
No	315	41	452	393	.415
Yes	60	8	324	305	.685

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985 and 1987.

Table A15. Mean Dairy Calcium Consumption of Women, by Calcium Supplementation, 1985 and 1987

Take Calcium Supplements	<u>Observations</u>		<u>Calcium Consumption</u>	Std. Dev.	t-score <sup>1</sup>
	No.	Percent	Mean (mg)	(mg)	
<u>1985</u>					
<u>Broome County</u>					
No	285	38	435	366	
Yes	106	14	414	375	
<u>Oneida County</u>					
No	276	37	404	368	.976
Yes	85	11	473	493	.943
<u>1987</u>					
<u>Broome County</u>					
No	275	36	459	443	
Yes	110	14	411	334	
<u>Oneida County</u>					
No	276	36	453	396	.152
Yes	100	13	370	337	.875

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985 and 1987.

Table A16. Mean Dairy Calcium Consumption of Women, by How Frequently They Take Calcium Supplements, 1985

Supplement Frequency	<u>Observations</u>		<u>Calcium</u> <u>Consumption</u>	Std.	t-score <sup>2</sup>
	No.	Percent <sup>1</sup>	Mean (mg)	Dev. (mg)	
<u>Broome County</u>					
Less than once a week	9	5	451	473	
Several times a week	24	13	439	372	
Daily	73	38	399	364	
<u>Oneida County</u>					
Less than once a week	8	4	903	1,225	1.027
Several times a week	22	12	435	410	.036
Daily	55	29	438	308	.641

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985.

<sup>1</sup> These percentages are from the number of women taking calcium supplements in each year, not from the total number of respondents overall.

<sup>2</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985.

Table A17. Mean Dairy Calcium Consumption of Women, by How Frequently They Take Calcium Supplements, 1987

Supplement Frequency	<u>Observations</u>		<u>Calcium</u>	<u>Std.</u>	t-score <sup>2</sup>
	No.	Percent <sup>1</sup>	<u>Consumption</u> Mean (mg)	<u>Dev.</u> (mg)	
<u>Broome County</u>					
Less than once a week	21	10	397	368	
Several times a week	19	9	493	358	
Daily	67	32	399	321	
<u>Oneida County</u>					
Less than once a week	9	4	386	323	.078
Several times a week	25	12	450	331	.417
Daily	65	31	338	343	1.054

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1987.

<sup>1</sup> These percentages are from the number of women taking calcium supplements in each year, not from the total number of respondents overall.

<sup>2</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1987.

Table A18. Mean Dairy Calcium Consumption of Women, by Whether or Not They Consider the Fat Content of Milk Before They Purchase It, 1985 and 1987

Consider Fat in Milk	<u>Observations</u>		<u>Calcium</u> <u>Consumption</u>	Std. Dev. (mg)	t-score <sup>1</sup>
	No.	Percent	Mean (mg)		
<u>1985</u>					
<u>Broome County</u>					
No	146	19	375	336	
Yes	239	32	462	384	
<u>Oneida County</u>					
No	146	19	412	456	.776
Yes	213	28	433	360	.834
<u>1987</u>					
<u>Broome County</u>					
No	100	13	437	416	
Yes	284	38	449	415	
<u>Oneida County</u>					
No	114	15	420	413	.300
Yes	260	35	435	369	.425

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985 and 1987.

Table A19. Mean Dairy Calcium Consumption of Women, by Whether or Not They Consider the Fat Content of Cheese Before They Purchase It, 1985 and 1987

Consider Fat in Cheese	<u>Observations</u>		<u>Calcium</u> <u>Consumption</u>	Std. Dev. (mg)	t-score <sup>1</sup>
	No.	Percent	Mean (mg)		
<u>1985</u>					
<u>Broome County</u>					
No	281	37	443	381	
Yes	107	14	394	333	
<u>Oneida County</u>					
No	260	35	429	411	.412
Yes	97	13	395	375	.014
<u>1987</u>					
<u>Broome County</u>					
No	262	34	433	387	
Yes	122	16	470	473	
<u>Oneida County</u>					
No	281	37	428	394	.163
Yes	95	12	441	348	.503

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985 and 1987.

Table A20. Mean Dairy Calcium Consumption of Women, by Whether or Not They Consider the Fat Content of Ice Cream Before They Purchase It, 1985 and 1987

Consider Fat in Ice Cream	<u>Observations</u>		<u>Calcium</u> <u>Consumption</u>	Std. Dev.	t-score <sup>1</sup>
	No.	Percent	Mean (mg)	(mg)	
<u>1985</u>					
<u>Broome County</u>					
No	309	41	434	372	
Yes	68	9	398	340	
<u>Oneida County</u>					
No	286	38	422	398	.379
Yes	66	9	438	426	.601
<u>1987</u>					
<u>Broome County</u>					
No	277	36	434	386	
Yes	105	14	478	486	
<u>Oneida County</u>					
No	295	39	422	384	.392
Yes	73	10	467	372	.165

SOURCE: Telephone surveys of female consumers in Broome and Oneida counties, NY, 1985 and 1987.

<sup>1</sup> These t-scores provide a measure of the significance of the difference in mean calcium consumption levels between women in Broome and Oneida counties in 1985 and 1987.

APPENDIX 2

**CALCIUM CONSUMPTION FOLLOW-UP SURVEY**  
**Questionnaire**  
**October 1987**

TIME NOW: \_\_\_\_\_

- 1) Are you the main grocery shopper or food preparer in your household?  
(CIRCLE NUMBER)

YES ..... 1  
NO ..... 2

- 2) How often do you purchase meals away from home, at least once a day, at least once a week, or less than once a week? (CIRCLE NUMBER)

AT LEAST ONCE A DAY ..... 1  
AT LEAST ONCE A WEEK ..... 2  
LESS THAN ONCE A WEEK ..... 3

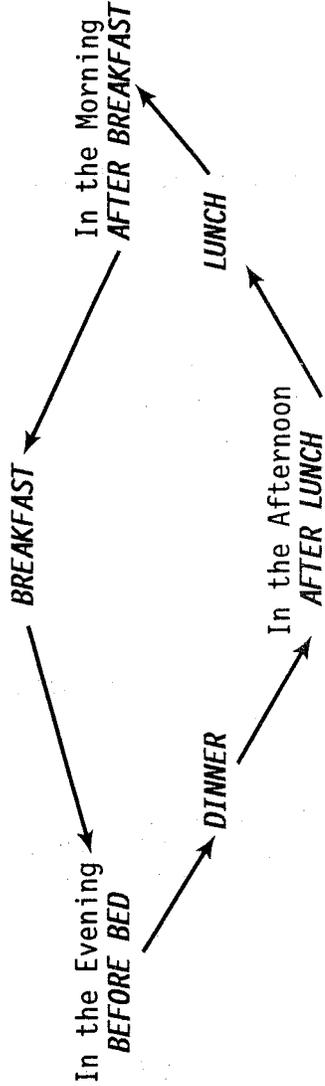
We are asking everyone that we call to tell us what they had to eat for the past 24-hour period. In order for the study to be useful, we need *detailed descriptions* of everything that you have eaten or drank, including snacks, since \_\_\_\_\_ (TIME NOW) yesterday.

It is often difficult to remember everything that you ate, so I will go over the past 24 hours with you. We are interested in what you actually ate, not what you usually eat. Also, I would like you to estimate portion sizes as best you can.

Thank you. We'll begin with today.

**(TAKE OUT YOUR "MEAL WHEEL" AND MAKE SURE THAT YOU HAVE IT IN FRONT OF YOU FOR THE DURATION OF THE 24-HOUR MEAL INFORMATION SECTION.)**

**THE "MEAL WHEEL"**



**WATCH OUT FOR:**

**MILK**

Type, amount, lowfat  
 Glass size, ounces, tablespoonful  
 Fluid vs. canned (condensed or evaporated) vs. dry

**CHEESE**

Kind (cheddar, colby, etc.)  
 Block cheese, prepared slices, shredded, melted, powder  
 Approximate **cut** by inches

**CREAM/YOGURT**

Real dairy cream?  
 Sour cream?  
 Low-fat yogurt?

**SALADS**

Cheese with it?  
 Dressing -- only if blue cheese, sour cream or yogurt

**PACKAGED FOOD ITEMS**

Boxed Macaroni and Cheese  
 Noodles, Soups, Instant and Potato dishes (e.g., AuGratin, Sour cream, etc.)  
 Gravies, Stuffing Mixes,

**VEGETABLES/MEATS**

Always ask if they had sauce on it

**SANDWICHES**

Cheese in it?  
 Open face sandwich with sauce?

**SAUCES/TOPPINGS**

Cream sauce  
 Cheese sauce  
 Real whipped cream, sour cream  
 Milk Gravy

**HOME-MADE DISHES (Whole dish can serve Macaroni and cheese how many people?)**

Casseroles -- especially tuna  
**Italian** dishes such as spaghetti, lasagna, pizzas (# of slices?)  
**Mexican** dishes such as chili, tacos, burritos, enchiladas  
 Soups such as onion, cream soups  
 Meatloaf  
 Stuffed dishes

**BREAKFAST FOODS**

Scrambled eggs, omelets (How many eggs?)  
 French toast (Amt milk/#toasts in batch?)  
 Pancakes (Milk? # of pancakes in batch?)



Thank you for your patience so far.

- 3) Did the last 24-hours seem like a fairly normal period for you, as far as your eating habits go? (CIRCLE NUMBER)

YES ..... 1  
NO ..... 2

- 4) Compared to the past 24-hours, do you usually eat more dairy foods than you did, about the same, less, or do you never eat dairy products? (CIRCLE NUMBER)

MORE DAIRY FOODS..... 1  
ABOUT THE SAME ..... 2  
LESS DAIRY FOODS ..... 3  
NO DAIRY FOODS ..... 4

- 5) Do you ever have an upset stomach, gas or any physical discomfort after you've had a glass of milk, ice cream, or cheese? (CIRCLE NUMBER)

YES ..... 1  
NO ..... 2

- 6) Do you ever take calcium supplements? (CIRCLE NUMBER)

NO ..... 2  
YES ..... 1

- (IF YES) 6a) About how often do you take them, less than once a week, several times a week, or once a day or more? (CIRCLE NUMBER)

LESS THAN ONCE A WEEK ..... 1  
SEVERAL TIMES A WEEK ..... 2  
ONCE A DAY OR MORE ..... 3

Many dairy foods are available in low-fat, regular or high-fat varieties.

- 7) Do you consider the fat content of milk before you buy it? (CIRCLE NUMBER)

YES ..... 1  
NO ..... 2

8) Do you consider the fat content of cheese before you buy it?  
(CIRCLE NUMBER)

YES ..... 1  
NO ..... 2

9) Do you consider the fat content of ice cream before you buy it?  
(CIRCLE NUMBER)

YES ..... 1  
NO ..... 2

10) Do you feel that you consume more, about the same, or less dairy products than you did five years ago? (CIRCLE NUMBER)

MORE THAN 5 YEARS AGO..... 1  
ABOUT THE SAME ..... 2  
LESS THAN 5 YEARS AGO ..... 3  
NEVER EATS DAIRY FOODS ..... 4

11) In the past two years, did you notice local advertisements or announcements concerning calcium in your diet? (CIRCLE NUMBER)

YES ..... 1  
NO ..... 2 -----> GO TO QUESTION 13

12) Could you tell us who sponsored some of those advertisements or announcements? I am now going to read to you a list of possible sponsors. Were any of them sponsored by the United Dairy Farmers, the Dairy Council, the Cooperative Extension, the New York Dairy Farmers or some other organization? I can repeat those for you if you would like.  
(CHECK ALL THAT APPLY)

\_\_\_\_\_ United Dairy Farmers

\_\_\_\_\_ Dairy Council

\_\_\_\_\_ Cooperative Extension

\_\_\_\_\_ New York Dairy Farmers

\_\_\_\_\_ Other (ASK RESPONDENT TO SPECIFY IF POSSIBLE)

\_\_\_\_\_ Don't Know

13) During the past two years, have you attended programs on calcium or osteoporosis? (CIRCLE NUMBER)

YES ..... 1  
NO ..... 2 -----> GO TO QUESTION 16

14) Do you remember how many programs you attended?  
(WRITE NUMBER ON SPACE PROVIDED)

\_\_\_\_\_ NUMBER OF PROGRAMS ATTENDED

15) Did the Cooperative Extension Service sponsor any of the programs on calcium or osteoporosis you attended? (CIRCLE NUMBER)

YES ..... 1  
NO ..... 2  
DON'T KNOW ..... 3

16) Finally, we would like to ask a few questions about you and your household. How old were you on your last birthday?  
(WRITE EXACT AGE IN SPACE PROVIDED. IF RESPONDENT REFUSES TO GIVE HER EXACT AGE, TRY TO GET A RANGE, e.g., 50s, ABOUT MID-THIRTY, ETC.)

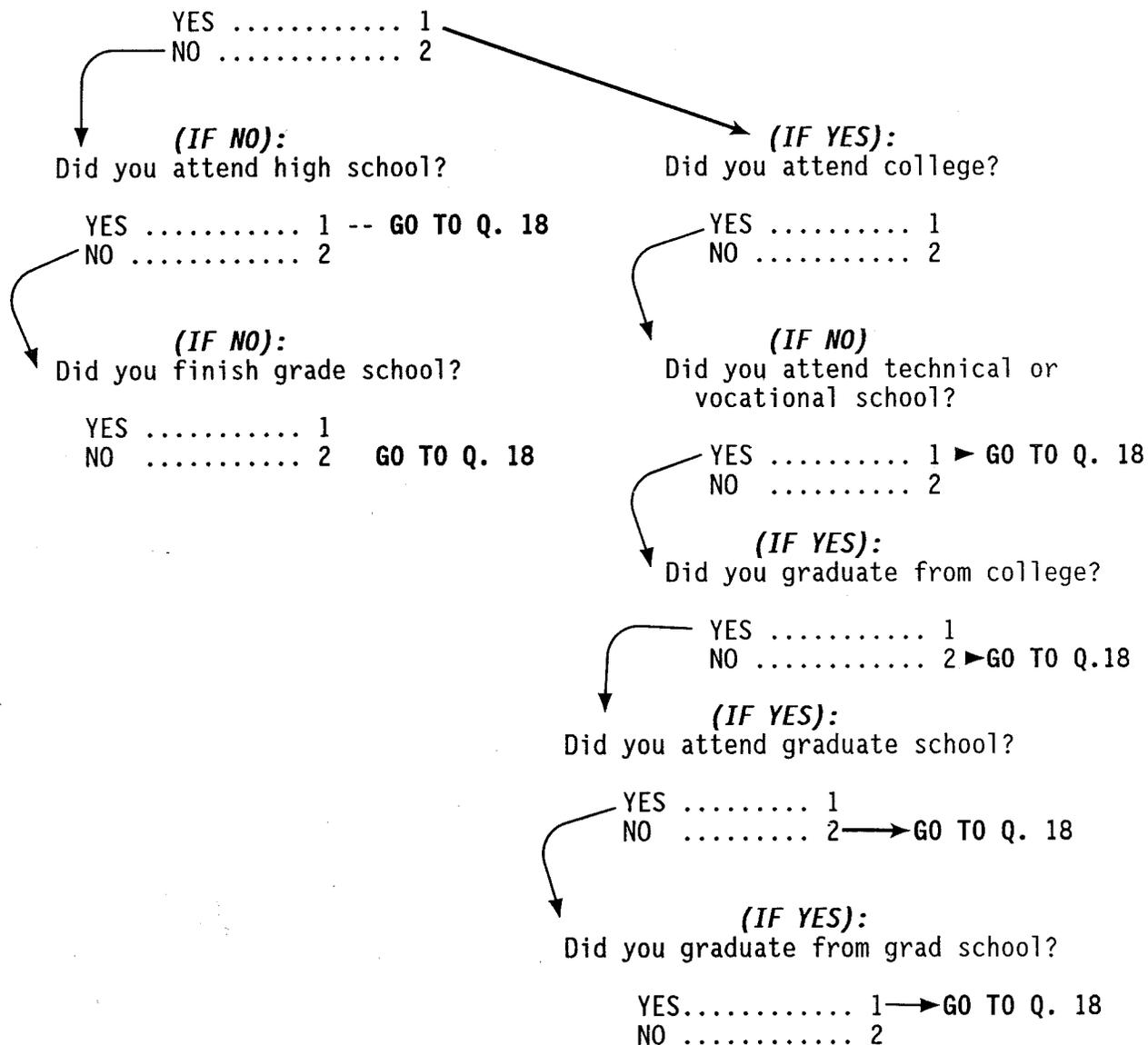
\_\_\_\_\_ YEARS ↘

(IF YOUNGER THAN 45 YEARS OLD:)

↘ 16a) Are you pregnant or nursing a baby at this time or both? (CIRCLE NUMBER)

YES ..... 1  
NO..... 2  
BOTH ..... 3

17) Did you graduate from high school? (CIRCLE NUMBER)



18) What is the number of people in your household, including yourself?  
(WRITE NUMBER ON SPACE PROVIDED)

\_\_\_\_\_ PEOPLE IN HOUSEHOLD

19) Is your household's **GROSS** annual income, that is, before taxes, above \$20,000? This means the **total income** of everyone in your household who share household **food expenses**, including yourself, your spouse, or anyone else living with you at present. (CIRCLE NUMBER)

YES ..... 1  
 NO ..... 2



**(IF NO):**

Is your gross income below \$10,000?

YES ..... 1  
 NO ..... 2

**(IF YES):**

Is your gross income above \$30,000?

YES ..... 1  
 NO ..... 2

IF RESPONDENT ASKS "What do you mean by household income?", YOU RESPOND:

Do you share **FOOD EXPENSES**?

**YES**

We mean your pooled incomes.

**NO**

We mean your personal income.

20) Would you be interested in receiving a pamphlet telling about the importance of calcium in your diet? (CIRCLE NUMBER)

NO ..... 2  
 YES ..... 1



ASK RESPONDENT TO GIVE YOU HER NAME AND ADDRESS. WRITE THIS INFORMATION ON THE TOP RIGHT HAND CORNER OF YOUR COVER SHEET. IF YOU'RE AT ALL UNSURE ABOUT THE SPELLING, ASK HER TO SPELL IT OUT FOR YOU.

REPEAT ALL THE INFORMATION FOR YOUR RESPONDENT TO CONFIRM. THEN SAY THE FOLLOWING:

You should receive that pamphlet within the next four weeks.

*Thank you very much for all your time and trouble. Good bye.*

TIME NOW: \_\_\_\_\_